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EDITORIAL COMMENTS

Depression in Elderly Primary Health Care Clinic Attendees in Ilorin, Nigeria.

O.A. Adegunloye, O.I.N. Buhari , O.A. Abiodun

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Abstract

Depression in the elderly presenting at primary care settings is usually under- detected by primary care physicians. This study assessed the prevalence of depression and the utility of the Geriatric Depression Scale (Short Form) in detecting depression in elderly patients in primary care populations in Ilorin, Nigeria. This was a two stage cross-sectional study with data obtained from three primary care centres in Ilorin, using a proforma for socio-demographic variables and GDS-SF for depression screening. The second stage involved use of Depression Module of MINI (without knowledge of first stage scores) on all those with scores of ≥ 6 and a 15% random sample of those with scores < 6 on GDS-SF. Data analysis was by use of SPSS version 21 while level of significance was set at $P < 0.05$.

A total of 463 patients participated in the study. Prevalence of depression was found to be 3.2%. Depression was not found to be significantly associated with socio-demographic factors, but being divorced, separated or widowed, as well as, being female, increased age, feeling lonely and presence of at least one chronic physical illness showed trends towards caseness on GDS-SF. All 15 patients who screened positive on GDS-SF for depression were confirmed on MINI interview to be cases of depression.

In conclusion the use of short screening instrument such as GDS-SF may improve detection rate for late life depression in busy primary care clinics in Nigeria. Primary care physicians should particularly look out for at risk groups such as divorced, separated and widowed elderly patients for routine screening for depression.

Keywords: Elderly, Depression, GDS-SF, Screening.

Introduction

There is a rapid increase in the world's population of elderly people as a result of the increase in the life expectancy which occurred since the 20th century^{1, 2, 3}. As part of aging, the elderly may experience changes in physical, mental and social health status, as well as, loss events such as bereavement^{4, 5}. These changes may result in higher rates of morbidity, disability and mortality in the elderly population. The increased morbidity may also result in increase, in the use of health facilities with consequent rise in health related cost of care^{3,6-9}.

Depression is a frequent diagnosis in the elderly with prevalence rates ranging from 7.4% to 50% depending on the populations studied and methodology used^{10, 11}. In late life, depression may pose a diagnostic challenge in primary care, in that elderly patients may have difficulties in recognizing its symptoms or may present with somatic symptoms which may closely mimic symptoms of a physical illness¹². In addition, a co-morbid physical illness may be present and the side effects of the medications used in its treatment may also mimic the symptoms of depression. Depression may complicate physical disorders such as stroke, cancer and epilepsy. It may also have a potentially harmful effect on the elderly by resulting in obesity, geriatric anorexia and their attendant consequences on physical health status. There can also be increased risk of physical harm as a result of prolonged reaction time to potential hazards¹³.

Recognition of late life depression by primary care physicians is very crucial in its management, in that the elderly particularly those with comorbidities may be very vulnerable to the debilitating impact of depression. Depression may also be inversely related to the patients quality of life, functional disabilities, medication adherence, multiple and prolonged health care facility utilization^{14,15}.

Apart from similarities of some symptoms between depression and physical illness in late life being a challenge to the diagnosis of late-life depression in primary care, other factors reported by primary care physicians as militating against case detection include inadequate knowledge and skill, as well as, pressure for time in busy primary care facilities¹⁵⁻¹⁷.

In order to solve the problems of recognition, diagnosis and treatment of depression in the elderly attendees of primary care and its attendant negative

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impacts, researchers have suggested collaborative care models¹⁷ but in developing countries like Nigeria where there are limited number of psychiatrists particularly old-age psychiatrists, there may not be enough to cover most of the primary care centres. The use of screening tools has therefore been suggested as a strategy to improve detection of depression in primary care settings^{17,18}.

The present study aimed to determine the rate of depression among elderly patients in primary care settings and the usefulness of a screening tool (GDS-SF) in identifying such cases.

Methods

This was a cross-sectional, two-stage study, in which patients 60 years and older, who could talk and gave their consent were recruited from three government owned primary care centres in Ilorin, over a period of four months. After the patient had been attended to by their primary care physician, they were approached and sociodemographic details (like age, sex, living arrangement e.t.c) were collected using a specially designed proforma, after which the Geriatric Depression Scale – Short form (GDS-SF) was used to screen for depressive symptoms. These two instruments were administered by a trained research assistant. The GDS-SF, has been previously used in Africa, particularly Nigeria. It has a good sensitivity and specificity for predicting depression in the older adults^{2, 19}. Those scoring ≥ 6 on GDS-SF and a 15% random sample of those scoring < 6 had second stage assessment conducted by one of the authors (O.A) without knowledge of scores from first stage assessment, using the Mini International Neuropsychiatric Interview (MINI).

Later, the clinical records of all the patients were examined to see if there had been a previous diagnosis of depression by the attending primary care physicians. The diagnosis of the presence of any comorbid chronic physical illnesses by the physicians was also documented.

Statistical Analysis: The statistical package for Social Sciences (SPSS) version 21 was used for data entry and analysis. Descriptive statistics were calculated for all variables. Chi square (χ^2) and regression analysis were used to examine associations between variables and a Pvalue set at < 0.05 considered as statistically significant.

Ethical Considerations

Ethical approval was obtained from the Ethical Review Committee of the University of Ilorin teaching Hospital, Ilorin ERC PAN/2013/01/1185. The procedures used were in accordance with ethical standards in compliance with the Helsinki Declaration. Informed consent was obtained and confidentiality of

data was ensured.

Results

A total of 463 patients were assessed during the study period.

Table 1 shows the sociodemographic characteristics of the patients. Of the 463 participants, 259 (55.9%) were in the age group 60-69 years, 386 (83.4%) were females and also a majority were either separated, divorced or widowed 240 (51.8%), with only a few 61 (13.2%) living alone. Thirty four (7.3%) participants reported feeling lonely. There was also the presence of at least one chronic physical illness in 181 (39.1%) of the elderly patients.

Case detection by GDS-SF

A total of 15 (3.2%) patients were identified by the screening instrument (GDS-SF) as cases of depression.

Table II shows the relationship between sociodemographic variables and GDS-SF scores. Those who were divorced/separated or widowed were found to be significantly associated with positive GDS-SF scores ($\chi^2=4.925$; $p<0.026$).

Table 1:

Variables	Frequency (N = 463)	Percent
Age group (years)		
60 – 69	259	55.9
70 – 79	164	35.4
≥ 80	40	8.6
Gender		
Male	77	16.6
Female	386	83.4
Marital status		
Married	223	48.2
Separated/ Widowed	240	51.8
Ethnicgroup		
Yoruba	445	96.1
Hausa	3	.6
Igbo	3	.6
Others	12	2.6
Religion		
Christianity	95	20.5
Islam	368	79.5
Lives alone		
Yes	61	13.2
No	402	86.8
Feel lonely		
Yes	34	7.3
No	429	92.7
Ever drink		
Yes	41	8.9
No	422	91.1
Presence of chronic illness		
Yes	181	39.1
No	282	60.9

Table II: Relationship between demographic variables and GDS-SF scores

Variable	GDSpositive		Total n (%)	χ^2	p value
	Yes n (%)	No n (%)			
Age group (years)					
60 – 69	6 (2.3)	253 (97.7)	259	3.112	0.211
70 – 79	6 (3.7)	158 (96.3)	164		
≥ 80	3 (7.5)	37 (92.5)	40		
Gender					
Male	2 (2.6)	75 (97.4)	77	0.000 ^Y	1.000
Female	13 (3.4)	373 (96.6)	386		
Marital status					
Married	3 (1.3)	220 (98.7)	223	3.828 ^Y	0.0504
Divorced/Separated/Widowed	12 (5.0)	228 (95.0)	240		
Ethnic group					
Yoruba	15 (3.4)	430 (96.6)	445	3.484 ^Y	0.322
Hausa	0 (0.0)	3 (100.0)	3		
Igbo	0 (0.0)	3 (100.0)	3		
Others	0 (0.0)	12 (100.0)	12		
Religion					
Christianity	3 (3.2)	92 (96.8)	95	0.003	1.000
Islam	12 (3.3)	356 (96.7)	368		
Lives alone					
Yes	2 (3.3)	59 (96.7)	61	0.137 ^Y	0.711
No	13 (3.2)	389 (96.8)	402		
Feel lonely					
Yes	1 (2.9)	33 (97.1)	34	0.161 ^Y	0.688
No	14 (3.3)	415 (96.7)	429		
Ever drink					
Yes	2 (4.9)	39 (95.1)	41	0.025 ^Y	0.874
No	13 (3.1)	409 (96.9)	422		
Presence of chronic illness					
Yes	7 (3.9)	174 (96.1)	181	0.373	0.541
No	8 (2.8)	274 (97.2)	282		
Child neglect					
Yes	13 (3.1)	409 (96.9)	422	0.025 ^Y	0.874
No	2 (4.9)	39 (95.1)	41		

χ^2 : Chi square; *: p value < 0.05 (i.e. statistically significant)

Though there was no significant association between the age of the participants and the GDS-SF scores, there was however a trend towards positive GDS-SF scores with increasing age. Although not statistically significant, being a female also showed a trend towards positive GDS-SF score. The presence of at least one chronic physical illness also showed a trend towards having a positive GDS-SF score.

Table 3 showed that being separated, divorced or widowed was a predictor of a positive screen result ($P=0.038$; $OR=3.860$; $CI=1.075-13.863$).

Table 4 illustrates that all the 15(3.2%) patients who scored ≥ 6 on the GDS-SF were confirmed during second stage assessment with MINI to be cases of depression. None of the patients assessed with MINI

who scored < 6 on GDS-SF were found to be cases of depression. This gives a sensitivity of 100% and specificity of 100% for GDS-SF in the study population. The primary care physician did not make any reference to depression in the case notes of the 15 cases identified in the study population.

Discussions

The prevalence of depression in the elderly in our study was 3.2% which is lower than earlier reports within Nigeria^{20, 21, 22}. This observation may be due to cultural difference among the population studied, as this study was carried out in North Central Nigeria, which is the middle belt zone of the country where an almost admixture of both northern and southern traditions may be found within the same zone, unlike

Table 3: Predictor of GDS positive using Forward linear multiple logistic regression

	B	p value	OR	95% C.I.	
				Lower	Upper
Marital status (Divorced/Separated/ Widowed)	1.351	0.038	3.860	1.075	13.863
Constant	2.944	<0.001	19.000		

B: Coefficient of logistic regression; OR: Odds ratio; 95% CI: 95% Confidence Interval

Percentage of cases correctly predicted: 96.8%

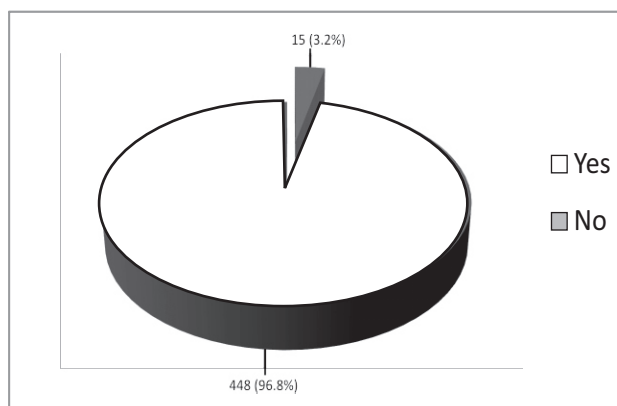
Variables not in the equation: Age, Gender, Religion, Ethnic group, Hypertension, Living alone, Feel lonely, Ever drink, Child neglect

Table IV: GDS and Mini screen

	GDS			χ^2	p value
	Positive n = 15 (%)	Negative n = 64 (%)	Total n = 79 (%)		
Mini screen					
Positive	15 (100.0)	0 (0.0)	15 (19.0)	72.633 ^Y	<0.001*
Negative	0 (0.0)	64 (100.0)	64 (81.0)		

χ^2 : Chi square; Y: Yates corrected chi square

Sensitivity of GDS: 100.0%; Specificity: 100.0%

**Figure 1:** GDS-SF positive

This illustrates that (15) 3.2% of the study population was positive on screening.

the earlier studies in the southern and northern parts of the country. The finding is however similar to reports from South Africa²³ and 3.9% in China²⁴. Several studies from all over the world have shown great variabilities in the prevalence of depression in the elderly^{11,25,26}. This variation may be explained due to the differences in sample population, culture, instruments used and measures taken as well as the definitions of depression taken²⁶⁻²⁸.

This study like most previous studies also did not find a direct statistical association between age and depression^{9,20,22,28} but found a trend for increased risk for depression with advancing age which may be explained by the increased probability of experiencing more losses in terms of health status, socio-economic powers, as

well as, loss of loved ones, all which make them more susceptible to depression²⁹. However, this finding is not in keeping with the report of a decreased rate of depression in the very old, from southwest Nigeria²⁰. The difference could be of cultural origin and the better utilization of social amenities and literacy in the south western parts of the country.

The interesting finding of no statistical association between depression and advanced age in spite of increased risk of biological, social and emotional vulnerabilities may be that the elderly are protected from depression by what has been termed socio-emotional selectivity as well as, wisdom³⁰. Also it has been reported that when other health variables have been controlled for, age may no longer have a prominent explanatory role on the development of late life depression^{28,31}.

In this study, there was no statistically significant association between gender and depression in old age, which is in keeping with some previous reports that has led to the suggestion of a narrowing of the gender gap in depression in late life³² but the trend of more elderly females having clinically significant depression in this study may be lending credence to some reports that concluded, that the female gender may be more at risk for depression^{4,33,34}. Some of the reasons to explain this may be that females may “magnify” and “catastrophize” more than the males, in addition³³ to other contributing factors like hormones and social factors^{4,35}.

Furthermore this study, seems to give credence

to a few studies^{27, 35, 36} that have highlighted, marital status of being “separated, divorced or widowed” as significantly associated with depression in old age, while a few others did not^{37, 38}, which has led to conflicting views. One would expect that marriage being a structural form of social support and social integration, which could be stress-buffering in nature³⁹ would be of a greater benefit to the elderly. However it is well documented that poor social support is a risk factor for depression in late life⁴⁰. Also there have been reports that certain life events, such as marital separation and termination (divorce or widowhood) in the late life may lead to changes in achieved social relations which may lead to loneliness and depression in the older population⁴¹⁻⁴⁴. However, in contrast exit from a bad marriage may provide a sense of relief which may improve the elder's psychological wellbeing better than remaining in a distressing married situation which could be more damaging to one's psychological wellbeing.

Though not statistically significant, this study revealed that the elders who lived alone had no increased likelihood for the diagnosis of depression, than those who did not live alone. This is not consistent with earlier reports^{20, 45}. The explanation for which may be that living alone was not perceived as a lack of social support^{32, 40, 45}. While consistent with earlier reports²⁰, this study revealed more clinical depression among elders who felt neglected by their children since this might have been perceived as a lack of essential social support^{46, 47}. Furthermore, it is not surprising that most of the participants did not drink alcohol as this is against the study participants' religious belief and the few who did had clinically significant depression.

The current study though not significant, is in keeping with earlier findings^{20, 22, 23, 34, 38} that revealed a higher likelihood for depression to be comorbid with a chronic physical illness. This may be due to the interaction of several factors such as the illness itself, medication induced and social factors such as demands and cost of managing such illnesses as well as functional limitations^{38, 48, 49}.

It is not surprising that the current study revealed a poor rate of detection of depression in the elderly clinic attendees, which is also consistent with earlier reports of poor detection rates of psychiatric disorders in primary care, particularly late life depression^{5, 6, 23}. Mental disorders in primary health care has become a major health concern with the current estimate of about 50% of the world's population having a life time experience of mental health challenges, it's recognition, diagnosis with management and a possible referral to a psychiatrist has become very important in the primary health care setting, which has been described as an ideal setting for this purpose. So this also includes the detection and management of late life

depression which is also globally prevalent in order to prevent its attendant effect of increased health care facility utilization and possible negative impact on the elderly^{5, 6, 18, 50, 51, 52}.

There may not be a single solution to this complex and multifactorial problem but a multi-level type of solutions aimed at the elderly patient, the primary care physician and collaboration in medical practice^{17, 18, 50, 52}. Since the primary care physician is usually the first line of contact for patients, it becomes imperative that they should be able to identify and diagnose depression in the elderly, hence the need for a screening tool to aid in the diagnosis⁵². The Geriatric Depression Scale – Short Form (GDS-SF) is one of such tools and it is a 15- item questionnaire derived from the original 30-item questionnaire. It is easy to administer to the physically ill elderly patients and completion time is about 5 to 7 minutes. The validity and reliability is good with 92% sensitivity and 89% specificity and it has been recommended as a screening tool for depression in the elderly^{53, 54}.

The present study has the advantage of being one of the few multicentric studies on depression in late life, particularly in Nigeria. It also used a specific screening tool the GDS –SF, which was aimed at identifying depressive psychopathology in the elderly as well as, the use of the M.I.N.I which has been validated for both the DSM – IV and ICD – 10 for the confirmation of diagnosis of depression⁵⁵. However the limitations are the cross-sectional nature of the study which does not allow for direct causal inferences between the socio-demographic variables and depression. The other limitations are the relatively small sample size and the presence of some <5 subsets on statistical analysis.

In conclusion, we found that socio-demographic variables and the presence of a chronic physical illness may not always be associated with depression in late life. Late life depression, may in the primary care setting, go undetected and untreated. So it is recommended that the regular use of a brief screening tool such as the GDS-SF be used to enhance the primary care physicians' and other medical workers' skill in the detection and diagnosis of depression in the elderly. This will lead to better management thereby forestalling the possible negative impact of late life depression.

References

1. Tiwari SC, Scrivastava G, Tripathi RK, Pandey NM, Agarwal GG, Pandey S and Tiwari S. Prevalence of psychiatric morbidity amongst the community dwelling rural older adults in Northern India. *Indian J Med res* 2013; 138, 504-554.
2. Stanley PC, and Onya ON. Prevalence, presentation and co-morbidity pattern associated with depression among Geriatric patients attending the GOPD of

- UPTH. *Int. Res. J. Medical Sci.* 2013; 1 (13): 17-24.
3. Pracheth R, Mayur SS, Chowti JV. Geriatric depression scale: A tool to assess depression in elderly. *Int J Med. Sci Public Health.* 2013; 2: 31-35.
4. Santos Ferreira PC and Santos Tavares DM. Prevalence and factors associated with rates of depression among elderly residents in rural areas. *Rev Esc Enferm USP* 2013; 47 (2): 396-401.
5. Uwakwe R. Psychiatric Morbidity in elderly patients admitted to non-psychiatric wards in a general teaching hospital in Nigeria. *Int. J. Geriatr. Psychiatry* 2000; 15: 346-354.
6. Kumar KL, Kar S, Reddy PK. Psychiatric comorbidity in geriatric inpatients. *J Dr NTR Univ Health Sci.* 2012; 1 (2): 81-85.
7. Noel PJ, William JW, Unützer J, Worchel J, Lee S, Cornell J et al. depression and cormorbid illness in elderly primary care patients: Impact on multiple domains of health status and well-being. *Ann fam med.* 2004; 2 (6): 555-562.
8. Dening T, Bain J. Mental health services for residents of care homes. *Age Aging.* 2004; 33(1):1-2.
9. Sokoya OO, Baiyewu O. Geriatric depression in Nigerian primary care attendees. *Int. J Geriatr Psychiatry.* 2003; 18: 506-510.
10. World Health Organization Burden of Mental and Behavioural Disorders. *The World Health Report 2001; Mental Health: new understanding, new hope.* Geneva, Switzerland, 2001: 3-4, 19-45, Box 3
11. Helmer C, Montagnier D, Peres K. Descriptive epidemiology and risk factors of depression in the elderly. *Psychol. Neuropsychiatr. Vieil.* 2004; 2 (1): 57-512.
12. Blazer DG and Hybels C. Origins of depression in later life. *Psychol Med.* 2005; 35:1-12.
13. Chapman DP, Perry GS, Strine TW. The vital link between chronic disease and depressive disorder. *Psychiatric Dis.* 2005; 2: A14.
14. Moussavi S, Chatterji S, Verdes E, Tandon A, Patel V, Ustun B. Depression, chronic diseases and decrements in health. Results from the world health surveys. *Lancet.* 2007; 370:851-858.
15. Cepolu M, McCusker J, Cole MG, Sewitch M, Belzile E, Ciampi A. Recognition of depression by non-psychiatric physicians – A systematic literature review and meta-analysis. *J Gen Intern Med.* 2007; 23 (1): 25-26.
16. Wittchen HU and Pittrow D. Prevalence, recognition and management of depression in primary care in Germany: the depression 2000 study. *Human psychopharmacol.* 2002; 17 (1): 1-11.
17. Samuel S, Abram R, Shengelia M, Reid C, Goralewicz R, Breckman R, Anderson MA, Snow CE, Woods EC, Stern A, Eimicke JP, Adelman RD. Integration of geriatric mental health screening into primary care practice: a patient satisfaction survey. *Int J Geriatr Psychiatry.* 2015; 30 (5): 539-546.
18. Park M and Unützer J. Geriatric depression in primary care. *Psychiatr. Clin North Am.* 2011; 34 (2): 469-487.
19. Uwakwe R and Prince M. Identifying dementia and depression in the elderly: The role of the family. *Niger J Clin Pract.* 2004; 7 (2): 82-87.
20. Olutoki MO, Olagunju AT, Adeyemi JD. Correlates of depressive illness among the elderly in a mixed urban community in Lagos, Nigeria. *Aging Ment. Health.* 2014; 18 (5): 561-569.
21. Gureje O, Kola L, Afolabi E. Epidemiology of major depressive disorders in elderly Nigerians in the Ibadan study of aging: A community-based survey. *Lancet* 2007; 370 (9591): 957-964.
22. Yusuf AJ. Late life depression in rural community of Northern Nigeria. *A dissertation submitted to the National Post Medical College of Nigeria.* 2009; Unpublished manuscript.
23. Peltzer K and Phaswana-Mafuya N. Depression and associated factors in older adults in South Africa. *Globs Health Action.* 2013; (6): 18871. <http://dx.doi.org/10.3402/gha.v6i0.18871>. Accessed on 21/2/2017.
24. Chen R, Copeland JR, Wei L. A meta-analysis of epidemiological studies in depression of older people in the People's Republic of China. *Int J of Geriatr Psychiatry.* 1999; 14 (10): 821–830.
25. Goud AA and Nikhade NS. Prevalence of depression in older adult living in old age home. *IAIM* 2015; 2 (11): 1-5.
26. Ozaki Y, Sposito APB, Bueno DRS, Guariento ME. Depression and chronic diseases in the elderly. *Rev Soc Bras Clin Med.* 2015; 13 (2): 149–153.
27. Cole MG and Dendukuri N. Risk factors for depression among elderly community subjects: A systematic review and meta-Analysis. *Am J Psychiatry.* 2003; 160: 1147–1156.
28. Robert ER, Kaplam GA, Shema SJ, Straw-bridge WJ. Does growing old increase the risk of depression. *Am J Psychiatry.* 1997. 154: 10: 1384–1390.
29. Fiske A, Wetherell JL, GatzM. Depression in older adults. *Ann Rev Clin Psychol.* 2009; 5 (3): 63–89.

30. Carstensen L, Mayr U, Pasupath M, Nessel-roade J. Emotional experience in everyday life across the adult life. *J. Pers. Soc. Psychol.* 2000; 79: 644–655.
31. Buber I and Engelhardt H. The relation between depressive symptoms and age among older Europeans finding from SHARE. *Comparative population studies.* 2011;103-126.
32. Singh SD. Loneliness, Depression and sociability in old age. *IJIP.* 2015; 2(2): 73–79.
33. Bonnewyn A, Katona C, Brufaerts R, Haro JM, de Graaf R, Alonso J, Demyttenaere K. Pain and depression in older people: comorbidity and patterns of help seeking. *J Affect Disord.* 2009; 117: 193–196.
34. Fiske A, Gatz M, Pedersen NL. Depressive Symptoms and Aging: The effects of illness and Non-health related events. *J Gerontol :series B.* 2003; 58 (6): 320–328.
35. Mohammed EM, Abd-Elhamed MA. Depression among elderly attending geriatric clubs in Asyut city, Egypt. *Journal of American Science.* 2011; 7 (11): 386–391.
36. Yan XY, Huang SM, Huang CQ, Wu WH, Qin Y. Marital status and risk for late life depression: a meta-analysis of the published literature. *J Int Med Res.* 2011; 39 (4): 1142–1154.
37. Baiyewu O, Smih-Gamble V, Lane KA, Gureje O, Gao S, Oguniyi A, et. al. Prevalence estimate of depression in elderly community-dwelling African American in Indianapolis and Yoruba in Ibadan, Nigeria. *Int Psychogeriatr.* 2007; 19 (4): 679-689.
38. Djernes JK. Prevalence and predictors of depression in populations of elderly: a review. *ActaPsychiatr Scand.* 2006; 113:372-378.
39. Shapiro A and Keyes CLM. Marital status and social wellbeing: Are married always better off? *Soc Indic Res.* 2008; 88: 329-349.
40. Prince MJ, Harwood RH, Blizard RA, Mann AH. Social support deficits, loneliness and life events as risk factors for depression in old age. The Gospel Oak Project VI. *Psycho Med.* 1997; 27: 323-332.
41. Burholt V and Scharf T. Poor health and loneliness in later life: The role of depressive symptoms, social resources and rural environments. *J Gerontol: Series B.* 2014; 69 (2): 311-324.
42. Perlman D and Peplau LA. Towards a social psychology of loneliness. In S. W. Duck & R. Gilmour (Eds.), personal relationships in disorder (pp. 31-56). London: Academic Press.
43. de Jong Gierveld J, Van Tilburg T, Dykstra PA. Loneliness and social isolation. In A Vangelisti& Perlman D (Eds.), Cambridge handbook of personal relationships (pp. 485-500). Cambridge: Cambridge University Press.
44. Lee GR and DeMaris A. widowhood, Gender and depression: A longitudinal Analysis. *Res Aging.* 2007; 29: 56-72.
45. Gureje O, Oladeji B, Abiona T. Incidence and risk factors for late-life depression in the Ibadan study of aging. *Psychol Med.* 2011; 41 (9): 1897-1906.
46. Cornwall EY, Waite LJ. Social disconnectedness, perceived isolation and health among older adults. *JHealth Soc Behav.* 2009;50(1):31-48.
47. Newsom JT. And Schulz R. Social support as a mediator in the relation between functional status and quality of life in older adults. *Psychol Aging.* 1996; 11(1):34-44.
48. Cornwell B. Age trends in daily social patterns. Research on aging. 2011; 33 (5): 598-631.
49. Vink D, Aartsen MJ, Schoever RA. Risk factors for anxiety and depression in the elderly: A review. *J Affect Disord.* 2008; 106: 29-44.
50. Hall CA and Remolds CF. Late-life depression in primary care setting: challenges, collaborative care and prevention. *Mauritas.* 2014; 79 (2): 147-152.
51. Wittchen H, Mühlhig S, Beesdo K. Mental disorders in primary care. *Dialogues Clin Neurosci.* 2003; 5 (2): 115-128.
52. Sharma VK, Lepping P, Cummins AGP, Copeland JRM, Parhee R, Mottram P. The Global Mental Health Assessment tool – Primary care version. Development, reliability and validity. *World psychiatry.* 2004; 3(2): 115-119.
53. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey M, Leirer VO. Development and validation of a geriatric depression screening scale: a preliminary report. *JPsychiatr Res.* 1982-1983; 17 (1): 37-49.
54. Greenberg SA. How to try this: The Geriatric Depression Scale: Short Form. *Am J Nurs.* 2007; 107 (10): 60-69.
55. Sheehem DV, Lecrubie Y, Sheehan K, Amorim P, Janavas J, Weiller E, et. al. The Mini International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *J. Clin Psychiatry.* 1998; 59 (20): 20-33.

Knowledge and practice towards Urinary Schistosomiasis in Paikon-Kore, Gwagwalada, Abuja-FCT, Nigeria

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Abstract

Urinary schistosomiasis continues to pose public health challenge remarkably in rural communities that lack safe source of water. Knowledge and practices of urinary schistosomiasis among risk groups is important for its control. This study was set to determine the knowledge and practices towards urinary schistosomiasis in Paikon-Kore, Gwagwalada Area Council.

A cross-sectional study was conducted on 385 randomly selected participants. Pre-tested, semi-structured, interviewer administered questionnaire was used to collect information on socio-demographic characteristics, knowledge, attitudes and practices of urinary schistosomiasis from the participants.

Three hundred and fifty (90.9%) participants were aware of urinary schistosomiasis mainly through school (29%) and elders in the community (29%). Two hundred and twenty (57.1%) participants knew that contact with infested stream increase the chances of disease transmission and 200 (51.9%) reported hematuria as the main symptom of urinary schistosomiasis. One hundred and eighty (46.8%) participants knew the causative agent of schistosomiasis and 94.3% believe it is curable. The participants were not willing to avoid fishing / farming to prevent urinary schistosomiasis. One hundred and twenty (31.2%) had experienced haematuria but only half of them sought treatment from health facility. Two hundred and forty six (64%) participants lack safe source of water while 275 (70%) lack appropriate means of faecal disposal.

Despite some level of knowledge of urinary schistosomiasis, poor attitudes and practices that enhanced transmission of the disease were widespread. Thus, there is need to provide alternatives to the stream water if the community is to kept away potential source of infection.

Keywords: knowledge, Practices, Urinary Schistosomiasis, Abuja, Nigeria,

Introduction

Schistosomiasis is one of the neglected tropical diseases (NTDs) and is recognized as one of the leading causes of severe morbidity in many parts of the world. It is also the second most prevalent and socio-economically devastating tropical parasitic disease after malaria¹. It continues to be a global public health problem posing a threat to over 700 million people in over 76 countries including Nigeria. The parasitic fluke that causes the disease are of the genus *Schistosoma spp.* and are transmitted through fresh water snails, which are the intermediate hosts¹. Urinary schistosomiasis is caused by *Schistosoma hematobium* and one of the main features of the disease is hematuria. This disease occurs in all 36 states of Nigeria including the Federal Capital Territory and is hyper endemic in many states of the north and southwest with moderate to low endemicity in the southeast²⁻⁴.

The disease is associated with water resource development projects such as dams and irrigation schemes, and slow-flowing and stagnant water, which support the breeding and survival of the snail intermediate host. The communities around such water development projects or stagnant inland waters regularly come in contact with the contaminated water and are at the great risk of the disease⁵ especially inhabitants of rural areas⁴. Schistosomiasis principally affects people who are unable to avoid contact with water either because of their profession (Agriculture, fishing) or because of lack of reliable sources of safe water for drinking, washing or bathing. Children are most heavily affected because of low level of resistance and intensive water contact⁶.

Schistosomiasis is a disease associated with poverty and low socio-economic class. Poor living conditions, overcrowding, poor sanitation, and a lack of clean water and medical services all increase the risk of contracting urinary schistosomiasis⁶. Several factors, such as culture, socio-economic status, environment and behavior directly influence the prevalence and intensity of urinary schistosomiasis. Nigeria has the greatest number of cases of schistosomiasis worldwide of about 29 million infected, making 14% of the global burden⁷. The prevalence of urinary schistosomiasis in both urban and rural communities in Nigeria is between 20-90%, occurring more among the poor and marginalized group living in the rural areas⁸. Various

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studies carried out on schistosomiasis in various states in Nigeria^{2,3,9} indicated that the disease may be increasing in prevalence and importance particularly in the remote poorly accessible rural communities. To carry out health education and as an intervention measure, there is need to determine the perception/knowledge and practice of the population regarding the disease. This shall assist in the development of the interventions.

The aim of the study was to determine the perception and practice of urinary schistosomiasis among rural dwellers in Gwagwalada Area Council, Federal Capital Territory-Nigeria.

Materials And Method

The study was conducted in Paikon-Kore; a rural community in Gwagwalada Area Council, Abuja, FCT, Nigeria. It is about ten kilometers from Gwagwalada town. The main economic activity of the community members is subsistence agriculture. A river that runs through Gwagwalada area council serves the rural community and others around it with water for irrigation and household activities. The study included both children and adults from the community, as the group that is greatly exposed to the stream.

Descriptive cross-sectional design was used to investigate children eight years and older living in Paikon-Kore at the time of the study. The eight-year age cut-off was determined during the pre-test of the questionnaire as the minimum age participants go to the stream (and thus get exposed to the disease) and are able to respond to the questionnaires. Random sampling technique was employed to recruit the minimum sample size of 385 determined using the Cochran formula. The village heads palace was chosen as point of commencement for recruitment of participants by convenience – with the added advantage of gaining community support. A coin was tossed to determine, the direction to move from the village head's palace – which was determined to be clockwise direction. The team then moved in clockwise direction recruiting one participant per household until the minimum sample size were recruited for the research. In households, where more than one person was eligible, one was selected by balloting.

The objectives and nature of the study were explained to the participants after which, informed consent was sought and obtained from all participants either directly for those 18 years old and above or indirectly through the parents / guardians for the minors. Assent was obtained from the minors after the parents / guardian gave consent. This was done before the data collection commenced. Permission and buy-in was also sought from the community leaders by explaining the study to them and requesting them to inform the community members about the study. The participants that were below eight years of age were

excluded from the study – due to almost non-exposure to the sources of transmission of the disease and inability to respond to the questionnaires on their own. A pretested interviewer-administered questionnaire was used to collect information on socio-demographic characteristics, knowledge, attitude and practices of participants that relates to urinary schistosomiasis. Five research assistants, with health related data collection experience, were recruited and trained for a day at the community for data collection. They were trained to standardize the data collection and reduce inter- and intra-interviewer errors.

Data was manually entered and checked for errors. Analysis was done using the Statistical Program for Social Sciences (SPSS) version 16. Summarized data was presented as prose, tables or figures depending on appropriateness of the variables. P-value of less than 0.05 was chosen as cut-off for statistical significance.

Results

Two hundred and twenty seven (59%) of the participants were females and a little over half were married. Two hundred and fifty three (57%) were 18 years of age or older. Twenty seven percent were farmers, while 50 (13%) had no orthodox education as shown in table 1.

Three hundred and fifty participants (91%) have heard of urinary schistosomiasis. Though 145 (38%) did not know the causative agent of the disease, 200 (52%) correctly identified haematuria as the main symptom of the disease as shown in table 2. The main sources of information about the disease among the participants were school and community elders, which accounted for 29% each, followed by health center which accounted for 14% as shown in figure 1.

One hundred and twenty (31%) participants had experienced blood in urine. The participants that had experience blood in urine used different methods to address the challenge which includes: 80 (67%), traditional medicine; 45(38%), orthodox hospital/ clinic and 10 (8.3%), religious homes. The remaining 8 (6.7%) did not seek care for the haematuria.

Three hundred and one participants (78%) use stream as their main source of water. There was no pipe borne water in the community as shown in figure 2.

One hundred and seventeen participants (30%) reported use of the appropriate means of faecal disposal. The remaining two hundred and seventy five (70%) participants use the following: 139 (35%), surrounding bush / environment; 79 (20%), defecate around the stream / pond, and 57 (14.4%), defecate “anywhere”.

The participants reported contact with potential sources of transmission – streams and ponds. However, the frequency of contact varies. One hundred and eighty seven (48%) reported frequent contact, 110

Table 1: Socio-demographic characteristics of participants

Characteristics	Frequency (n = 385)	Percentage
Age (years)		
8-18	132	34.3
>18	253	65.7
Gender		
Male	158	41.0
Female	227	59.0
Marital status		
Single	130	33.8
Married	198	51.4
Separated/Divorced	20	05.2
Widowed	37	09.6
Level of education		
No education	50	13.0
Primary education	150	39.0
Secondary education	120	31.2
Post Secondary education	65	14.3
Occupation		
Students	145	37.7
Farming/Fishing	105	27.3
Teaching	15	03.9
Civil servant	10	02.6
Petty trading	15	03.9
Others	95	24.6

Table 2: Distribution of participants' knowledge of urinary schistosomiasis

Variable	Frequency	Percentage
Aware of urinary schistosomiasis (n= 385)		
Yes	350	90.9
No	35	09.1
Causes of schistosomiasis (n=385)		
Witchcraft/spirits	60	05.6
Snails	80	20.8
Worms in water	100	26.0
Do not know	145	37.7
Transmission of urinary schistosomiasis*		
Swimming	100	26.0
Bathing	120	31.2
Eating dirty food	100	26.0
Others ("wicked spirits")	80	20.8
Do not know	50	13.0
Symptoms of urinary schistosomiasis*		
Fever	60	17.9
Cough	100	29.9
Bloody urine	200	51.9
Dysuria	150	44.8
Others	50	14.9
Availability of treatment		
Yes	300	77.9
No	85	22.1
Types of treatment* (n=300)		
Traditional	241	80.3
Orthodox medicine	283	94.3
Prayers	40	13.3
Donot know	45	15.0
Severity of urinary schistosomiasis (n=385)		
Very dangerous	297	77.1
Not dangerous	88	22.9
Why U/schistosomiasis is dangerous* (n=297)		
Prevent conception	53	17.8
Dries the body	70	23.6
Leads to death	209	70.4
Destroys your body	113	38.0
Causes anemia	100	33.7

*Multiple Responses

(28%) occasional contact while 69 (18%) rarely come into contact with potentially infested stream / pond. Twenty-five (6%) had no previous contact with potential sources of transmission of urinary schistosomiasis.

Seventy-six participants (20%) and 167 (43%) swim and farm respectively in potentially infested water and none of the participants recommended that these practices be avoided as shown in figure 3.

Discussion

Urinary schistosomiasis is one of the neglected tropical diseases, which is still endemic and thus a public health problem in Nigeria. Studies at various times have documented that Nigeria has a high prevalence rate of urinary schistosomiasis and this could be due to lack / inadequate safe water in the rural areas and emerging dams construction for fishing, irrigation and other domestic activities^{9,10}.

The level of awareness of urinary schistosomiasis is very high compared to reports from other parts of the country including the 74.5% from

northwestern Nigeria¹¹. This high level of awareness could be due to the endemicity of the disease in this part of the country. Some studies from the southern parts of the country also reported awareness levels of 33.8-64%.¹² which are lower than the result of this study. Similarly findings from other African countries revealed varying levels of awareness of urinary schistosomiasis¹³.

The commonest source of information about urinary schistosomiasis in the study population being school and elders in the community may explain the high proportion of participants with high awareness about the disease, unlike if their main sources were to be peers. However, those that were not aware seem very distant from the correct information as some related the disease to worms in water or snails. Interestingly, others even related causation of urinary schistosomiasis to eating dirty food and "wicked" spirits as has was also reported in other studies. The poor knowledge of the causative agent of the disease among the participants is in contrast to what was obtained in Ghana, where over 90% knew that urinary

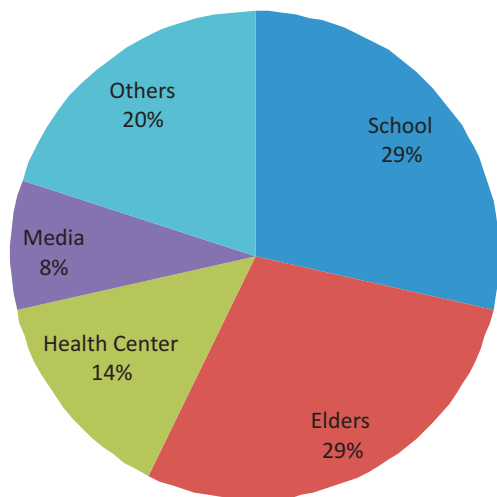


Figure 1: Sources of information about urinary schistosomiasis among the participants (n=350)

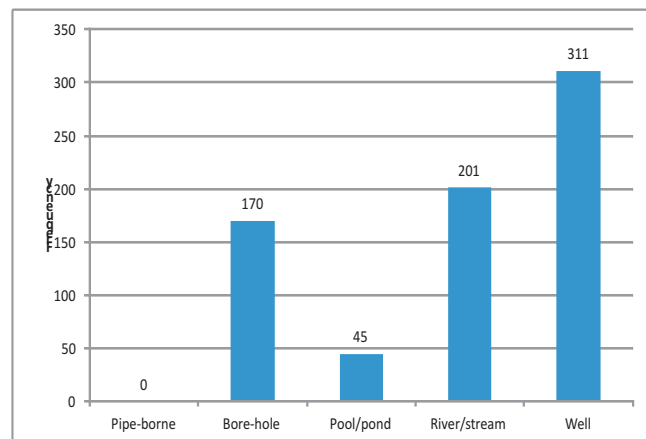


Figure 2: Participants' sources of water supply

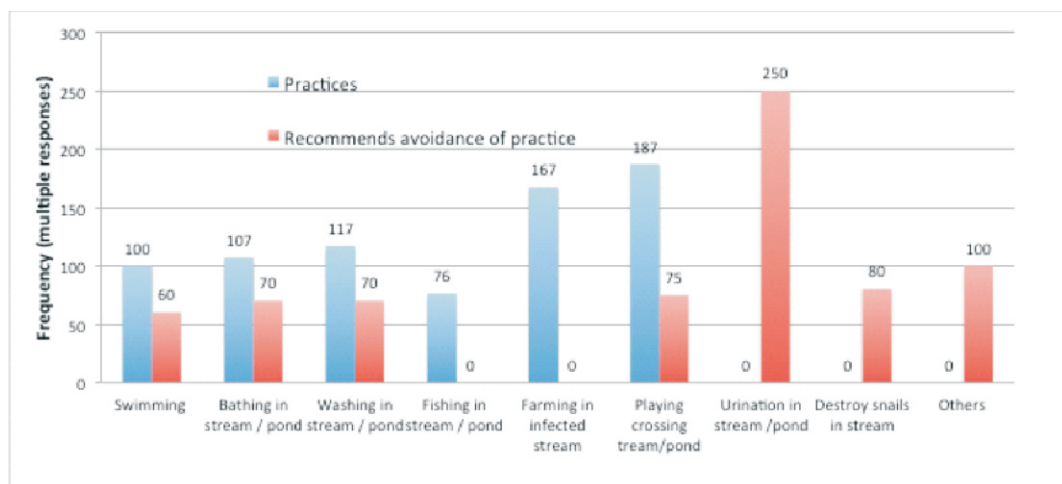


Figure 3: Comparison of actual and recommended practices that affects transmission of urinary schistosomiasis

schistosomiasis is water-borne and transmitted by parasites¹⁴.

However, about half of the respondents rightly associated water contact behavior with urinary schistosomiasis transmission in agreement with study carried out in Kano, Nigeria, where about 50% of the participants also recognized polluted water bodies as source of infection¹¹. Based on the participants' high level of awareness, one would expect high proportion of the community members to take precautionary measures against the disease, but there was high exposure to risk factors that include going to streams and rivers for domestic and other activities. An earlier study in Anambra state, Nigeria, also observed that most of the participants understood that contact with infested waters could lead to transmission of the disease, but they still carried out domestic activities in these waters¹⁵. Similar observations were made in earlier studies in some urinary schistosomiasis

endemic areas of Africa (Tanzania, Congo, Ghana, and Mozambique), Middle East (Yemen), South America (Brazil) and Asia (China)¹⁶⁻¹⁹. This indicates that awareness of transmission alone does not necessarily result in behavioral changes. What is required may be ensuring the availability of alternatives to the activities that brings the community members into contact with the sources of infestation – stream and ponds.

As reported in other studies, more than half of the participants quoted hematuria as the major symptom of the disease while a little below that reported dysuria as the major symptom. More than two-thirds of the participants believe the disease is dangerous and could lead to death. The perception of the dangerous nature of the disease may be as a result of the blood loss which many communities in Nigeria associate as a symptom of severe and dangerous diseases. This is far from what some of the participants in this study believe, as some of them consider the

haematuria symptom of urinary schistosomiasis as a sign of maturity, especially among males.

Though four-fifth were aware of availability of orthodox treatment for the disease, they also believe there is an effective traditional medicine for it. This may explain why though about one third had experienced blood in urine (hematuria) but less half of them sought orthodox treatment from health centers. Similar trend was reported in a study conducted in Ghana¹⁴. This could be due to their belief in the use of traditional medicine for a cure as most of the community members, use traditional medicine for one ailment or the other. It could also be the non-availability of the drug in the hospital and cost of medicine where available that pushed them to traditional medicine.

On prevention of urinary schistosomiasis, some of the participants recommended not urinating in streams/rivers/ponds as part of the preventive measures while a small proportion mentioned other measures as avoiding playing, swimming, bathing and other domestic activities in streams /rivers/ponds. Some participants did not recommend any measure to control the disease probably these are those that consider urinary schistosomiasis as sign of maturity. This may indicates poor health education on urinary schistosomiasis in the community. Thus, there is need to educate the community members about urinary schistosomiasis at any available opportunity, for example during mass drug administration campaigns and hospital visits.

The preference for use of river/stream and ponds for domestic activities such as washing and bathing despite the presence of borehole and wells in the community, may be related to the low significance given to urinary schistosomiasis as a disease and getting used to the “habit” of washing and bathing in the stream.

This poor practice of indiscriminate urination/defecation along the watersides or in the water and in nearby bushes seen among about one-third of the participants is seen in other rural areas and may be due to lack of toilets or habits, as reported in previous studies in Nigeria^{2,15,20}. This could be resolved by public enlightenment on the importance of using toilets.

The participants' practices that encourage transmission of urinary schistosomiasis include swimming, bathing, washing, farming including fishing and playing in the stream. However, despite knowing that these practices enhance the transmission of urinary schistosomiasis, most of the participants did not recommend avoidance of these practices. Rather they recommend other methods to prevent the transmission that include killing all snails and stopping urination in water. This could be because the

participants are conscious of the almost impossibility of avoiding the practices such as swimming, bathing, farming including fishing as they are the main source of income for the community members, which could not be stopped without alternatives. This is in addition to the fact that these practices have even become habits among the community members.

In conclusion, this study found very high level of awareness, some knowledge of urinary schistosomiasis among the participants that did not translate to better attitudes and practices that protect from contracting the disease. Most participants reported involvement in practices that encourage spread of the disease. Provision of pipe-borne water or boreholes for domestic activities shall encourage people to keep away from streams / ponds that may be infested. The health authorities should provide information on the hazards of swimming, washing or bathing in water suspected of being infested with the organism that causes urinary schistosomiasis. They should also educate on appropriate human waste disposal methods and provide them to the community. Health education in whatever form that would be meaningful to the rural dwellers should be advocated and followed through.

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References

1. Kebede D, Abdeljbar E, Samir H, Emmanuel K, Mohamed DO, Alam EM, et al. High prevalence of urinary schistosomiasis in two communities in South Darfur: implication for interventions. *Parasites & Vectors* 2011 4: 14.
2. Ekpo UF, Laja-Deile A, Oluwole AS, Sam-Wobo SO, Mafiana CF. Urinary schistosomiasis among preschool children in a rural community near Abeokuta, Nigeria. *Parasit Vectors* 2010 3:58.
3. Akinwale OP, Akpunoni VN, Ajayi MB, Akande DO, Adeleke MA, Gyang PV, et al. AA. Urinary schistosomiasis transmission in Epe, an urban community of Southwest Nigeria. *Trop Parasitol* 2011 Jul-Dec 1(2): 99-103.
4. Ekpo UF, Mafiana CF. Epidemiological studies of urinary Schistosomiasis in Ogun state, Nigeria: Identification of high-risk communities. *Niger J Parasitol* 2004 25:111–9.
5. Akinwale OP, Ajayi MB, Akande DO, Adeleke MA, Gyang PV. Prevalence of *Schistosoma haematobium* infection in a neglected community,

- South western Nigeria. *Int J Health Res* 2009 2:157–64.
6. Kamel IA, Elwi AM, Cheever AW, Mosimann JE, Danner R. SchistosomaMansoni and S. Hematobium in Egypt IV Hepatic lesions. *Am. J Trop. Med. Hyg* 1978 Sep; 27(5): 931-8.
7. Hotez PJ, Asojo OA, Adesina AM. Nigeria: "Ground Zero" for the High Prevalence Neglected Tropical Diseases. *PLoS Negl Trop Dis* 2012 6(7): doi:10.1371/journal.pntd.0001600
8. AEJ Okwori, M Sidi, YB Ngwai, SO Obiekezie, MD Makut, SC Chollom, IO Okeke, TI Adikwu. Prevalence of schistosomiasis among primary school children in Gadabuke District, Toto LGA, North Central Nigeria. *British Microbiology Research Journal* 2014 4(3): 255-261.
9. Adie HA, Okon OE, Awang GA, Braide EI, Ekpo UF. Spatial Distribution of urinary Schistosomiasis in Cross River State Nigeria. Using Geographical Information System and School based questionnaire. *Pakistan Journal of Biological Sciences* 2013 16: 1166 - 1172.
10. Arinola OG. Prevalence and severity of urinary schistosomiasis in Ibadan Nigeria. *East African Medical Journal* 1995 72: 746-748
11. Dawaki S, Al-Mekhlafi HM, Ithoi I, Ibrahim J, Abdulsalam AM, Ahmed A, et al. The menace of schistosomiasis in Nigeria: Knowledge, attitude and practice regarding schistosomiasis among rural communities in Kano State. *PLoS One*. 2015 10(11): e0143667. doi: 10.1371/journal.pone.0143667
12. Akinwale OP, Adeneye AK, Sulyman MA, Idowu ET, Adewale B, Manafa OU, et al. Health care seeking behaviour of people in endemic communities of Ogun and Niger states, Nigeria. *Nigerian J Parasitol* 2004 25: 121–126.
13. Odhiambo GO, Musuva RM, Atuncha VO, Mutete ET, Odiere MR, Onyango RO, et al. Low levels of awareness despite high prevalence of schistosomiasis among communities in Nyalenda informal settlement, Kisumu City, Western Kenya. *PLoS Negl Trop Dis*. 2014 8(4): e2784. doi: 10.1371/journal.pntd.0002784. pmid:24699502
14. Ekwunife CA, Ukaga CN, Okafor FC. Urinary schistosomiasis in Anambra State, Nigeria. *Nigerian J Parasit*. 2004 25: 127–131.
15. Adenowo AF, Oyinloye BE, Ogunyinka BI, Kappa AP. Impact of human schistosomiasis in sub-Saharan Africa *Braz J Infect Dis*. 2015 19(2):196-205.
16. Steinmann P, Keiser J, Bos R, Tanner M, J. Utzinger J. Schistosomiasis and water resources development: systematic review, meta-analysis, and estimates of people at risk. *Lancet Infect Dis*, 2006 6: 411–425.
17. Kapito-Tembo AP, Mwapasa V, Meshnick SR, Samanyika Y, Banda D, Bowie C, et al. Prevalence, distribution and risk factors for Schistosoma hematobium infection among school children in Blantyre, Malawi. *PLoS Neglect Trop Dis*, 2009 3: e361
18. Sady H, Al-Mekhlafi HM, Atroosh WM, Al-Delaimy AK, Nasr NA, Dawaki S, et al. Knowledge, attitude, and practices towards schistosomiasis among rural population in Yemen. *Parasit Vectors*. 2015 8: 436. doi: 10.1186/s13071-015-1050-8. pmid:26302747
19. Danso-Appiah A, Stolk WA, Bosompem KM, Otchere J, Looman CWN, Habbema JDF, et al. Health Seeking Behaviour and Utilization of Health Facilities for Schistosomiasis-Related Symptoms in Ghana. *PLoS Negl Trop Dis* 2010 4(11): e867. doi:10.1371/journal.pntd.0000867.
20. Oniya MO. Socio-cultural practices promoting the transmission of urinary schistosomiasis among school aged pupils in Southwestern village in Nigeria. *Research journal of Biological Sciences* 2007 2(1):1-4.

Evidences of Endemic *Schistosoma haematobium* Infection among School Children in Shonga Community, Edu Local Government Area, Kwara State, Nigeria.

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Abstract

A study was carried to determine the presence, level of endemicity and the intensity of human *Schistosoma haematobium* infection in Shonga community of Edu Local Government Area in Kwara State, Nigeria. For permission and maximum cooperation, intensive advocacy and mobilization of the community leaders, school authorities and the pupils preceded the collection of urine specimens which were preserved in 10% alcohol. Microscopic examinations were carried out on the urine specimens. Conclusive diagnosis was based on the characteristic terminal spined egg of *S. haematobium*. Altogether, 1,479 pupils (60.0% boys and 40.0% girls), aged between 4-20 years, were examined in the over sixteen schools in and around the community, selected by convenience. Of all the pupils examined, 1,144 (77.4%) had the characteristic eggs of *S. haematobium* in their urine samples. Infection rate for boys was 516 (45.1%) while it was 296 (25.9%) for girls. Thus, boys were significantly more infected than girls ($P < 0.05$). Children between 11-13 years of age had the highest prevalence of infection (47.2%) while those between 4-7 years of age had the least prevalence (30.0%). The overall mean egg-count for the 1,144 infected pupils was $1,598.0 \pm 49.32$, while the mean egg-counts for boys and girls were $1,213.0 \pm 25.6$ and 685.0 ± 18.3 respectively. The difference in the intensity of infection between boys and girls was also significant ($p < 0.05$). Of the 1,144 pupils who were infected with *S. haematobium* 195 (17.0%) had egg-count range of 1-1000, 758 (66.3%) had egg-count range of 1001-5000 while 191 (16.7%) had egg-count range of ≥ 5001 . The prevalence of haematuria was also significantly higher among boys than girls ($p < 0.05$). This study reveals that human *Schistosoma haematobium* infection is endemic in Shonga community.

The awareness about the impact, transmission and prevention of this infection was relatively poor. Research on vaccine development to support the existing chemotherapy for the control and possible elimination of this dreaded but highly neglected parasitic infection should be the priority. Therefore, advocacy, health education chemotherapy and vaccine must be adopted concurrently as the best intervention strategy/approach to eradicate Schistosomiasis.

Key words: *Schistosoma haematobium*, prevalence, infection, endemicity, intensity.

Introduction

Schistosomiasis (Bilharziasis) is a chronic granulomatous parasitic disease which is not immediately fatal but constitutes a major medical, public health and socio-economic problems. Thus, the disease is ranked second only to malaria among WHO/TDR targeted disease for global control and eradication. The disease is also highly ranked among the most important Neglected Tropical Disease. Currently, more than 300 million people are infected world-wide with schistosomiasis; 120 million show symptoms of the disease; 20 million suffer from severe illness, while over 400 million are at risk of becoming infected^{1,2}.

Schistosomiasis is increasing in distribution, intensity, including: inevitable association of human water contact for food production; construction of dams; generation of hydroelectric power; occurrence of animal reservoir host; the propensity of snail intermediate host; the phenomenon of parasite polyembryony; lack of effective vaccine or an ideal drug; lack of adequate epidemiological data to plan control measures; poor accessibility of several endemic rural community; ignorance and taboos and lack of political will to prioritize schistosomiasis for interventions. Schistosomiasis is a water-associated disease, and major occupational diseases, which is acquired through water contact (washing, bathing, fishing and recreation). Schistosomiasis is caused by infection with species of the trematodes of the genus *schistosoma*.

Two species of schistosome of considerable medical importance exist in Nigeria. The urinary form,

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Schistosoma haematobium and the intestinal form, *Schistosoma mansoni*. Pathological effects of schistosomiasis include: calcification of the urinary bladder; enlargement of the liver; the spleen and lymph nodes etc³. Failure to implement early control and intervention can lead to death. In Africa, the burden of schistosomiasis is increasingly noted and recognised as a significant public health problem among the poor population as a result of their increased water contact activities, poor hygiene practice and behaviour to water body^{4,5}. Most inhabitants in endemic villages are often infected with schistosomiasis, most especially *S. haematobium*, and if it is left untreated and undetected can lead to the calcification of the urinary bladder in the human host.

The epidemiological distribution and impact of the disease remain poorly documented in Kwara State, Nigeria and other African nations, but the disease is increasing in epidemiology, intensity and importance due to multiple factors which collectively make it difficult for the Nigeria Schistosomiasis Control Initiatives to implement any effective nation-wide control programme.

Shonga community of Edu Local Government Area (LGA) in Kwara State has never been surveyed for schistosomiasis before. Edu LGA enjoys good drainage of River Niger and its tributaries. The drainages encourage extensive human water-contact activities, such as fishing, agriculture, extensive irrigation during the dry and raining seasons. Edu Local Government Areas is vulnerable to schistosomiasis transmission while Shonga community in the LGA was specifically targeted because it is located close to / on Shonga stream which appears to harbour the snail intermediate hosts. The study is carried out to determine the endemicity of *S. haematobium* infection among school children in Shonga community.

Methodology

Edu Local Government Area in Kwara State, lies on latitude 9.8°N and longitude 5.7°E. The community is located about 120km to Ilorin, Kwara State capital. Shonga Community is drained by River Niger, and its tributaries that passed through the whole Shonga town. Unlike the other neighbouring towns, drainage of water from River Niger to Shonga town encourages accumulation of alluvial soil and improved soil fertility. The soil type in Shonga is loamy, which favoured agricultural activities such as rice cultivation, sugarcane plantation, and fishing. These are activities that ordinarily present high risk of schistosomiasis transmission.

Climate, Occupation, Population and Vegetation

The climate is of the humid tropical guinea type, it is marked by an alternating dry season period (November- March) and wet seasonal period (April-October). Annual rainfall ranges between 1000mm and 1500mm. And the mean temperature ranges from 30°C-35°

The predominant occupation in this community is farming. They engage in various agricultural practices such as rice cultivation, rearing of animal and sugarcane plantation, this led to the construction of dams and ponds for irrigation purposes.

Shonga community has an estimated population of about 6,871, and 4,795 of males and females respectively, with both sexes amounting to 11,666 as at 1991 population census, with a projection of about 15,459 in 1996.

The vegetation is mainly of the derived Guinea Savannah type, which is characterised by trees, shrubs, and grasses.

Study Design

In observance of the research ethics involving the participation of human subjects and also to secure permission and maximum cooperation, intense advocacy and community Mobilization was carried out, prior to collection of data. Thus, officials of the State and Local Government Areas, community leaders including the Emirs, his Chiefs, women leaders and religious leaders, local educational authorities, the Teachers and the Pupils, were properly briefed about the purpose, time, their role, benefit, importance, usefulness and procedures involved in the study. It was emphasized that participation was voluntary, but all were encouraged to do so, because of the associated benefits derivable from the study. School headmasters, mistresses, NYSC Corp members and the teachers were also contacted and enlightened about the disease, and for their maximum support and co-operation regarding the purpose and benefit of the study to the entire community.

Questionnaire Design

Questionnaire to collect relevant pupils' data for both urine and stool specimen was designed, pre-tested, standardized and mass produced, subject to the sample size. With the help of the teacher in each class, questionnaire was used to obtain each pupil's name, sex, home town, their parent occupation, duration of stay in the community, source of water for bathing, history of haematuria and complaints of stomach pain. Questions were also asked if the child wear shoe to school, about treatment for schistosomiasis. Measurement of the weight and height of each pupil was also carried out.

Sample size;

Sample size was calculated to be 1,479 pupils using Fisher's formula for population above 10,000 as described by Araoye⁶.

Collection of Urine

Urine specimens were collected between the hours of 11:00am till 1:00pm. Students were asked to run about 200 yards to facilitate egg excretion. Only one student was attended to at a time to avoid error and wrong labelling of specimen, school teachers also assisted in following pupils to the toilet in order to prevent sharing of urine by those pupils who could not give urine sample immediately.

Urine Microscopy

Examination of urine for the presence of eggs was carried out a day to three days after sample collection⁷. Each urine sample was thoroughly mixed to ensure even distribution of the contents, before a 10ml urine sample was taken with 10ml disposable syringes. Each 10ml urine sample was filtered through a wire mesh (No. 325), which was conically folded into a glass funnel⁸. In order to prevent transfer of eggs and other urine materials from one pupil to another, a beaker was not re-used until it had been washed thoroughly and left for 30 minute in running water. Thereafter, the filter was washed into a cross-hatched glass Petri dish with flat bottom (7.5cm diameter) and examined for the presence of *schistosoma* eggs, red blood cells, urinary cast, and crystals under x10 objective microscope. The total number of eggs present in each 10ml of filtered urine was counted with a talley hand counter. Repeated examination of urine filtrate showed that no eggs escaped into the filtrates. Each sample was counted in turn by the three independent observers, and the average of the three (3) counts was taken.

Data Analysis

Data Analysis was carried out using the Statistical Packages for Social Sciences (SPSS version 18.0). Statistical significance was determined at a P-value less

than 0.05.

Results

Results of the findings from this study are presented in both figures and tables. Figures 1 shows the water-contact activities in Shonga stream, and figure 2 shows, a well containing ova of *Schistosoma haematobium* from an infected pupil was show to demonstrate the intensity of the infection.

Prevalence of *Schistosoma haematobium* Infections by Age.

The prevalence of *S. haematobium* infection by age is presented in table 1 below. Age group 16-18 had the lowest prevalence (9.2%) and the age group of 10-12years had the highest prevalence of 22.6%. The general prevalence of the infection was 77.4%.

Mean Intensity of *Schistosoma haematobium* Infections Based on Egg-counts by Age and Gender

The egg-count/ 10ml urine sample ranged from 04 in a girl aged 20 years to a maximum of 5,511(in a 10 year old boy).

The overall mean egg-count for the 1,144 infected pupils was $1,598.0 \pm 49.32/10\text{ml}$ urine sample. The mean egg-count among the 744 infected male pupils was $1,213.0 \pm 25.6/10\text{ml}$ urine sample and $685.0 \pm 18.3/10\text{ml}$ urine specimen (Table 2). Thus, the mean egg-count for boys was significantly higher than for girls ($P < 0.05$).

Of 1,144 pupils whose urine were positive for eggs of *S. Haematobium* 195 (17.0%) had egg-count range of 1-1000, 758 (66.3%) had egg-count range of 1001–5000 while 191 (16.7%) had egg-count range of ≥ 5001 per 10ml of urine (Table 3).

Prevalence of Haematuric urine by gender and by Age

The prevalence of terminal haematuria by age group and sex is shown in Table 4. The age group 10-12 had the highest prevalence of terminal haematuria (40.3%) and followed by age group 7-9 years with a

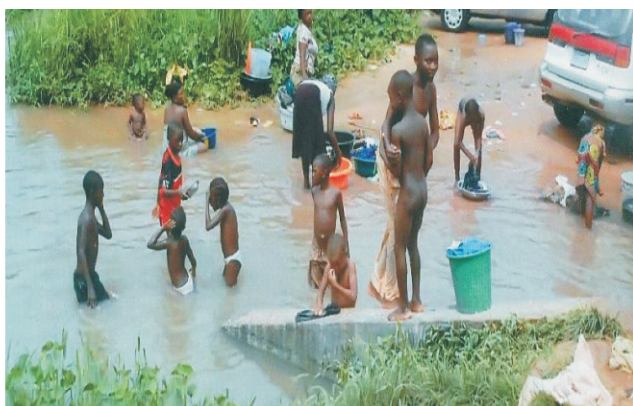


Fig. 1 Water- contact activities in Shonga stream, where transmission occurs.

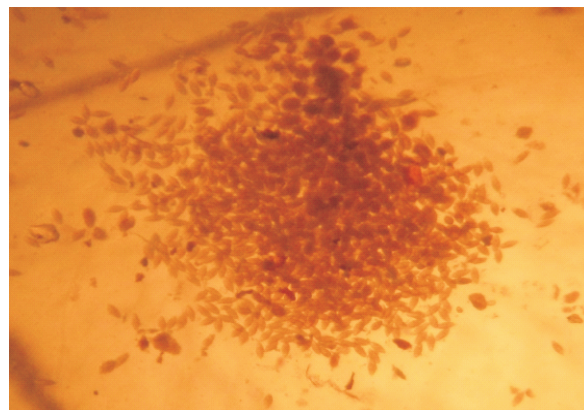


Fig. 2: A well containing ova of *Schistosoma haematobium* from an infected pupil.

TABLE 1: Prevalence of *Schistosoma haematobium* Infections by Age-Group (N=1,479)

AGE GROUP (Years)	No. EXAMINED	NO. INFECTED		
		BOYS (%)	GIRLS (%)	TOTAL (%)
4-6	276	128 (17.2)	75 (18.8)	203 (17.7)
7-9	286	125 (16.8)	83 (20.8)	208 (18.2)
10-12	331	163 (21.9)	96 (24.0)	259 (22.6)
13-15	236	118 (15.9)	77 (19.3)	195 (17.0)
16-18	174	105 (14.1)	0 (0.0)	105 (9.2)
= 19	176	105 (14.1)	69 (17.3)	174 (15.2)
Total	1,479	744(50.3)	400(27.1)	1,144(77.4)

P<0.05

TABLE 2: Mean Egg -Count of *Schistosoma haematobium* Infections (Eggs/10ml urine) by Age and Gender

Age-Group (Years)	MEAN EGG COUNT					
	BOYS		GIRLS		TOTAL	
	No. Infected	Mean Egg- Counts±Sd	No. Infected	Mean Egg- Counts±Sd	No. Infected	Mean Egg- Counts±Sd
4-6	128	886.0±32	75	672.0±19	203	779.0±27.01
7-9	125	1,369.0±71	83	679.0±18	208	1,024.0±48.1
10-12	163	1,276.0±68	96	960.0±21	259	1,118.0±44.0
13-15	118	1,358.0±66	77	830.0±17	195	1094.0±38.2
16-18	105	223.0±28	0	0.0±0	105	223.0±28.0
= 19	105	264.0±22	69	167.0±9	174	215.5±15.01
Total	744	1,213.0±25.6	400	685.0±18.3	1,144	1598.0±94.3

prevalence of 30.4%. Of 1,479 urine specimens examined, 632 (42.7%) were positive for macroscopic haematuria. Among 632 pupils with macroscopic haematuria, 544 (36.8%) were boys while 88 (5.9%) were girls. Thus, the prevalence of haematuria was significantly higher among boys than among girls ($p < 0.05$). When the intensity of haematuria was grouped into light (+), moderate (++) and heavy (+++), 285(45.1%), 212(33.5) and 135(21.4%) of the 632 haematuric urine were light, moderate and heavy respectively.

Prevalence of *Schistosoma haematobium* Infections by Parental Occupation

Of 1,479 pupils who completed and returned the questionnaire, occupational relation of parents were farmers, fishermen, traders, civil servants and others were presented in **Table 5**. The children whose parents were farmers had the highest prevalence of *S.haematobium* infection (40.0%) while pupils whose parental occupation was civil servant had the lowest prevalence (2.0%).

Discussion

The result of this study showed that of the 1,479 pupils examined, the prevalence of the infection was (77.4%). The prevalence recorded in this study appears relatively higher when compared with some results of the previous studies in this State and in other parts of

Nigeria. Ekundayo⁷ reported 46.6% in Eastern side of Kainji Lake in Nigeria. Edugbola *et al.*⁸ recorded 45.4% in Borgu Local Government Areas of Kwara State. Abdullahi and Saidu⁹ reported 40.0% prevalence in the neighbouring Niger State. Adeyeba and Ojeaga¹⁰ recorded 57.5% prevalence in Ibadan (Oyo State) while Mafiana *et al.*,¹¹ reported 71.8% prevalence in Ogun State. However, low prevalence of urinary schistosomiasis among school pupils had been reported elsewhere. Thus, Okpala *et al.*¹² recorded 0.13% prevalence in Plateau State, Uneke¹³ reported 26.8% in Ebonyi, and Biu *et al*¹⁴ reported 24.3% in Northern Eastern Nigeria.

The disparity in prevalence of urinary schistosomiasis in different studies and in different parts of the country could be attributed to multiple factors, including: non-uniformity in the methods used by various researchers¹, variation in the intensity, water contact behaviours and prior treatment or other interventions before reported studies were conducted. In primary schools in the Kainji Basin Areas where Pupils had been treated and Health Education given prior to her study, Nmorsi,¹⁵ reported lower prevalence of urinary schistosomiasis than the adjacent schools where no interventions had been launched like Shonga. In this study, boys had higher prevalence of urinary schistosomiasis than girls. Higher prevalence among boys than among girls had been reported by Dunah *et al.*,¹⁶ in Adamawa State. In contrast, Edungbola *et al*⁸

TABLE 3: Range of Egg- count by Age-Group among the 1,144 Infected Pupils

AGE GROUP (Years)	No. EXAMINED	No. INFECTED	NO AND PERCENTAGE OF PUPILS WITH THEIR EGG-COUNTS RANGE		
			(1-1000 eggs/10ml urine)	(1001-5000 eggs/10ml urine)	(=5001 eggs/10ml urine)
4-6	276	203	32 (16.4)	113 (14.9)	27 (14.1)
7-9	286	208	41 (21.0)	117 (15.4)	31 (16.2)
10-12	331	259	63 (32.3)	216 (28.5)	61 (31.9)
13-15	236	195	24 (12.3)	118 (15.6)	42 (22.0)
16-18	174	105	19 (9.7)	101 (13.3)	19 (9.9)
= 19	176	105	16 (8.2)	92 (12.1)	12 (6.3)
Total	1,479	1,144	195	758	191

Table 4: Grades of the Intensity of Terminal Haematuria by Gender and by Age-Group

Age-Group (years)	NO.(%) Infected	Haematuria by gender		Total haematuria (%)	No.(%) in grade of terminal haematuria		
		Boys (%)	Girls (%)		Light (+)	Moderate (++)	Heavy (+++)
4-6	203	120	19	139(22.0)	49	58	32
7-9	208	164	28	192(30.4)	80	64	48
10-12	259	223	32	255(40.3)	127	76	52
13-15	195	27	8	35(5.5)	20	12	3
16-18	105	6	1	7(1.1)	5	2	0
=19	105	4	0	4(0.7)	4	0	0
Total	1,144	544(36.3)	88(5.9)	632(100)	285(45.1)	212(33.5)	135(21.4)

TABLE 5: Prevalence of *Schistosoma haematobium* infection by Parental Occupation

PARENTAL OCCUPATION	NO.(%) OF PUPILS WHO COMPLETED AND RETURNED QUESTIONNAIRE	NO. (%) OF PUPILS INFECTED
FARMER	896 (59.9)	458 (40.0)
FISHERMAN	311 (20.8)	709 (62.0)
TRADER	103 (6.9)	214 (18.7)
CIVIL SERVANT	127 (8.5)	97 (8.5)
OTHERS	42 (2.8)	103 (9.0)
TOTAL	1,479	21 (1.8)

df=5 P<0.05

reported that girls were more infected than boys in the Babana study. Differences in gender prevalence in different studies could be related to disparity in water contact activities between boys and girls, attributable to physical, cultural, social and behavioural factors rather than gender immunity. Boys are physically stronger, more adventurous and more playful. Thus, they are more exposed to infection than girls. Girls, reaching adolescence faster, are more timid to expose their bodies in public while swimming. Girls also participate more in domestic work and are more restricted to home environment by their parents than boys.

The highest prevalence of *S. haematobium* infection (47.2%) was found among the age-group of 11-13 years. This corresponds to some reported works where the highest prevalence of urinary

schistosomiasis fall within the same age group^{17,18,19}. This could be due to longer cumulative years of active exposures to contaminated streams and infection than the younger and older age-groups particularly in most rural areas like in Shonga.

In this study the mean egg-count was significantly higher for boys than for girls ($p < 0.05$). Nduka *et al.*,²⁶ reported similar findings but Ejima and Odaibo²⁷ reported higher mean egg-count for girls than for boys. These variations are likely to be associated with the prevalence and intensity of infection as dictated by degree of exposure for physical, cultural, social, behavioural and environmental factors.

This study reveals a relationship between the level of schistosomal endemicity and the intensity of infection by age-groups. Age-group 11-13 years with

the highest prevalence, also had the highest overall mean egg-count. This finding is contrary to the report of Ejima and Odaibo²⁷ where more pupils in the age group 4-10 years had the highest range of egg-count. The disparities are most likely related to variation in the onset of exposure to infection. Besides, the disparity in age determination in communities where there is no birth certificate could account for the differences.

Of 1,479 Pupils whose urine samples were macroscopically examined, (29.2%) had visible terminal haematuria. The prevalence of haematuria seen in this study was higher than what Huldah *et al.*,²⁰ reported (21.8%). Correspondingly the prevalence and intensity of infection were higher in this study. Terminal haematuria was higher among boys (67.1%) than among girls (32.9%). Similar observations were made where the prevalence of terminal haematuria was higher among boys than among girls^{20,21,22,23}. In their own study, Huldah *et al.*,²⁰ reported a higher prevalence of terminal haematuria among girls (44.5%) than among boys (31.1%). The higher prevalence of terminal haematuria is largely a reflection of higher prevalence and intensity of the infection. Caution should be exercised in interpreting terminal haematuria among females in their adolescent years for their monthly menstrual period can be easily misinterpreted to terminal haematuria for Urinary Schistosomiasis. The highest prevalence of haematuric urine in this study (42.7%) was reported among the age group 11-13 years. In his study, Amali,²⁴ reported a higher prevalence (51.1%) of haematuric urine among age-group 10-15 years also. In contrast, higher prevalence of haematuric urine was recorded among pupils whose age ranges from 4-7 years in a study conducted by Ladan *et al.*,²⁵. The higher prevalence of haematuric urine seen among age-group 11-13 years in this study is a reflection of higher prevalence and intensity of infection found among this age-group and could be due to variation in infection rates as well as longer cumulative years of active exposures to contaminated streams and infection of this age-group than the younger and older age-group.

We also showed that water-related occupational activities carry greatest risk of schistosomal infection. Thus, children of fishermen and food-producing farmers were the most affected. Steinmann *et al.*²⁸ and Mafiana *et al.*¹¹ similarly reported that water-associated occupations carry higher risk of water-related infections.

Conclusions And Recommendations

Up till this moment, the ecological settings of most communities in and around Kwara State has created excellent sites favourable for the breeding of both the snail intermediate host and the Schistosome parasites, creating a good synergy for schistosomiasis endemicity. This study revealed that schistosomiasis

haematobium infection is endemic in Shonga community. The relatively high prevalence of terminal haematuria encountered (42.7%) was a reflection of heavy intensity of *S. haematobium* infection among the pupils in this locality. The awareness about the mode of transmission, the socio-economic impact, the public health implications and other associated harmful effects as well as control measures about this parasitic infection are very pauc. Therefore, that it is most desirable to conduct similar studies like this within and outside this geographical areas and appropriate interventions, in form of health education, chemotherapy and the provision of basic amenities (safe water supply and sanitation facilities) should be launched. General awareness, personal hygiene and relevant health education messages should be built into the Primary School curriculum; it will go a long way for the control efforts of the disease.

References

1. Adeyeba, O.A. and Akinladi, A.M. Intestinal parasitic infection among school children in rural community, South Western Nigeria. *Nigeria Journal of Parasitology*, 2002: Vol 2 (1), 23: 11-18.
1. Agbolade O. M, Agu N. C, Adesanya O. O, Odejaye A. O, Adigun A. A, Adesanlu E. B, Ogunleye F. G, Sodimu A. O, Adeshina S. A, Bisiriyu G. O, Omotoso O. I and Udia K. M. Intestinal helminthiasis and schistosomiasis among school children in an urban center and some rural communities in southwest Nigeria. *Nigeria journal of Parasitology*, 2007: **45**(3): 233-238
2. Tilahun A. Abraham D. Berhanu Erko. Soil-Transmitted Helminths Infections and Associated Risk Factors among School children in Durbete Town, Northwestern Ethiopia. *Ethiopian journal of Tropical Medicine*, 2015: Vol 4; pg 345-349.
3. Amaechi E. C, Ohaeri C. C and Ukpai O. M. Prevalence of helminthiasis among school children in some rural communities of Abia State, Nigeria. *Animal Research Institute*, 2013: **10**(3): 1817-25.
4. Biu, A.A., Nwosu, C. O. and Akuta, A. The incidence of human schistosomiasis in Maiduguri, Northern Nigeria. *Biological science of Resource and Communicable diseases*, 2000: Vol 12(1): 9-1127.
5. Araoye, M.O research methodology with statistical for health and social sciences. *Nathadex publisher, saw-mill* 2003.
6. Ekundayo J. O, Aliyu H. M and Jolly P. E. A review

- of intestinal helminthiasis in Nigeria and the need for school-based intervention. *Nigeria Journal of Tropical and Public Health*, 2007; Vol6: 33-39.
7. Edungbola, L.D., Asaolu, S.O., Omonisi, M.K., Ayedun B. A. *Schistosoma haematobium* among school children in Babana district Kwara state Nigeria. *Nigeria journal of science*, 1987 21(1&2):40-44.
 8. Abdullahi M. and Saidu, T.B. Prevalence of urinary schistosomiasis among school aged children in wushishi local government of Niger state, Nigeria. *Bayero Journal of Pure and Applied Sciences*, 2012: Vol4(2):53-55
 9. Adeyeba, O.A. and Ojeaga, S.G. Urinary schistosomiasis and Concomitant urinary tract pathogens among school children in Ibadan, Nigeria. *African Journal of Biomedical Research*, 2002: Vol (5):103-107.
 10. Mafiana, C.F., Ekpo, U.F. and Ojo, D.A Urinary schistosomiasis in Pre-school children in settlement around Oyan reservoir in Ogun state, Nigeria. Implication for control. *Tropical Medicine and Intestinal Hematology*, 2003; 8 (1):78-82. *Medical ecology.org copyright 2004. In collaboration with jolcelyndavies*.
 11. Hany S, Hesham M. Al-Mekhlafi, Wahib M.A, Ahmed K. Al-Delaimy, Nabir A.N, Salwa D, Mona A. Awatif M.A, Kek H. C, Johari S. Knowledge, Altitude and Practices toward schistosomiasis among rural population in Yemen. *Parasite and vector*, 2015: Vol 8:436
 12. Uneke, C., Oyibo, P., Ugwuoru, C., Nwanokwai, A., Iloegbunam, R. Urinary Schistosomiasis Among School Age Children In Ebonyi State, Nigeria. *The Internet Journal of Laboratory Medicine*, 2006: Vol2 Number 1.
 13. Biu, A.A., Nwosu, C. O. and Akuta, A. The incidence of human schistosomiasis in Maiduguri, Northern Nigeria. *Biological science of Resource and Communicable diseases*, 2000: Vol12(1):9-1127.
 14. Nmorsi O, Ukwandu N, Ekwungenya O, Obhiemi N. Evaluation of CD4(+)/CD8(+) status and urinary tract infections associated with urinary schistosomiasis among some rural Nigerians. *African Health Science*, 2005:5(2):126-30.
 15. Weekly epidemiological record 30 April No.18, 2010, 85, 157-164. *World Health Organization*. Available at <http://www.who.int/wer>. Accessed Sept. 27, 2010.
 16. Ekpo UF, Laja-Deili A, Oluwole AS, Samwobo S Mafiana CF. Urinary schistosomiasis among preschool in a rural near Abeokuta, Nigeria. *Parasitology Vector*, 2010:3:58 doi:10.1186/1756-3305-3-58
 17. Emmy-Egbe I. O. Prevalence of intestinal helminthes parasite in relation to age and occupation in Ihiala, Anambra State, Nigeria. *Journal of Natural and Applied Science*, 2012: Vol11(2): 1-5.
 18. Chi-ling fu and Micheal H. Hsieh. *Schistosoma haematobium* Egg Isolation. *Biological protocol*, 2012: Vol 2, Iss 20, 2541 views, 1.
 19. Huldah C.S. Geoffrey . Maurice O. Maurice R. Pauline N.M. *Schistosoma haematobium* hotspots in south Nyanza, western Kenya: Prevalence, distribution and co-endemicity with *Schistosoma mansoni* and soil-transmitted helminths. *Centre for Global Health Research Institute*, 2014.
 20. Leder K, Weller P. Epidemiology; pathogenesis; and clinical features of schistosomiasis. *Up-to-date* [serial online] 2009:1-9. Available at <http://www.uptodate.com>
 21. Hany S, Hesham M. Al-Mekhlafi, Wahib M.A, Ahmed K. Al-Delaimy, Nabir A.N, Salwa D, Mona A. Awatif M.A, Kek H. C, Johari S. Knowledge, Altitude and Practices toward schistosomiasis among rural population in Yemen. *Parasite and vector*, 2015: Vol 8:436
 22. Houston S, Kowalewska-Grochowska K, Naik S, McKean J, Johnson E. S, and Warren K. First Report of *Schistosoma mekongi* Infection with Brain Involvement. *Clinical Infectious Diseases*, 2004; 38: 1-6.
 23. Amali, O. Schistosomiasis haematobium infection among primary school children in Benue State, Nigeria. *Nigeria Journal of Parasitology*, 1993: Vol 5(1) 14: 59-63
 24. Ladan M.U, Abubakar U, Abdullai K, Bunza MDA, Ladan M.J. Urinary schistosomiasis in selected villages around Gusau Dam site, Zamfara State Nigeria. *Nigeria journal of Basic Applied Science*, 2012; 20:189-194.
 25. Nduka, F.O., Ajaero, C.M., and Nwoke, B.E. Urinary schistosomiasis among school children in an endemic community in southern Nigeria, *Applied Parasitology*, 1995.36(1):34-40.
 26. Ejima, I.A. A and Odaibo, A.B. Urinary schistosomiasis among school Children in Abuja local government area of Kogi State. Nigeria. *Journal of Science and Resources*, 2007:7:30-35.
 27. Steinmann P, Keiser J, Bos R, Tanner M, Utzinger J. Schistosomiasis and water resources development: systematic review, meta-analysis, and estimates of people at risk. *Lancet Infectious Disease*, 2006; 6: 411-25.

Urinary Schistosomiasis: A Study Among Primary School Pupils In A Rural Community In Nigeria

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Abstract

Urinary schistosomiasis is endemic in Nigeria and represents a significant public health challenge especially among inhabitants of rural areas. Against this background, this study aimed at determining the prevalence and associated risk factors of urinary schistosomiasis among children in a rural community in Nigeria. A total of 214 primary school pupils consisting of 98 females and 116 males were recruited for this study. Participant's age ranged from 5 years to 15 years. Urine samples were collected during the school hours from all participants and examined for the presence of ova of *Schistosoma haematobium* using light microscopy. A detailed questionnaire was used to obtain socio-demographic data from study participants. The prevalence of urinary schistosomiasis among the participants was 5.6%. Females were observed to have a higher prevalence of urinary schistosomiasis than males although the difference was not statistically significant ($P = 0.149$). Urinary schistosomiasis was significantly affected by participants source of getting drinking water ($P = 0.149$) and father's occupation ($P = 0.012$). Although participants with a history of bathing in rivers were observed to be more infected (6.7%) than those without such history (2.9%), the difference was not statistically significant ($P = 0.348$). Participant's age, religion, and father's educational status did not significantly affect the prevalence of urinary schistosomiasis ($P = 0.708$). The study concluded that the prevalence of urinary schistosomiasis was significantly affected by participant's source of drinking water and father's occupation. Increased enlightenment campaign and provision of social amenities for rural Nigerian communities is advocated

Key words: *Schistosoma haematobium*, pupils, okada community, Nigeria

Introduction

Urinary schistosomiasis is a major public health problem in developing countries of the world. It is reported to be endemic in Africa, especially among residence of rural communities¹. Urinary schistosomiasis is endemic in Nigeria^{1, 2, 3}. Urogenital schistosomiasis results when adult female *Schistosoma haematobium* worm pairs living in the veins draining key pelvic organs, including the bladder, uterus, and cervix, release terminal-spine eggs that penetrate the tissues and are excreted in the urine to allow propagation of the parasite life cycle⁴.

Schistosoma haematobium infection has been linked to chronic inflammation and pain, as well as growth stunting and cognitive deficits among tens of millions of children⁵. Reports indicate that about 75 % of girls and women with chronic *Schistosoma haematobium* infection experience deposition of eggs with granulomas and sandy patches on their uterus, cervix, and lower genital tract⁴. This has been associated with contact bleeding, discharge, and secondary infections and diminished fertility among them⁴. *Schistosoma haematobium* infection produces bladder wall pathology in approximately 18 million people in sub-Saharan African and 10 million people suffer from hydronephrosis and renal failure⁶. *Schistosoma haematobium* eggs have now been further identified as a Group 1 carcinogen responsible for a unique squamous cell carcinoma, which is widespread in *Schistosoma haematobium* – endemic areas^{7, 8}. It has also been reported to increase the risk of HIV infection among women in some African studies^{9, 10, 11}. However, despite its overwhelming public health importance and its well-established links to HIV/AIDS and cancer, *Schistosoma haematobium* has been labeled among the neglected tropical diseases (NTD)^{12, 13}.

Schistosomiasis remains a burden in Nigeria and a major health problem in many rural communities of the country¹. Urinary schistosomiasis has been reported to be associated with low-socio-economic and educational status in previous studies^{14, 15}. These factors are common in rural communities of Nigeria^{16, 17}. While there are few studies presently exist on the prevalence of urinary Schistosomiasis in Nigeria, none have specifically focused on inhabitants of Okada community, which is the headquarters of Ovia-North East Local Government Area of Edo State, Nigeria. Monitoring of disease in any community is critical for

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the proper articulation and implementation of intervention programs. Against this background, this study aimed at determining the prevalence of urinary schistosomiasis among children in rural community of Okada, Edo State, Nigeria.

Materials And Methods

Study Area

Okada, a rural community, is the headquarters of Ovia North East Local Government Area of Edo-state and Igbinedion University and Teaching Hospitals are located there. The Local Government has an estimated population of 155,344 persons¹⁸. Majority of the residents of Okada are farmers with few civil servants, lecturers and students making less than 5% of the community.

Study population

The study was carried out among pupils attending Ikaledaran primary school Okada, Edo State, Nigeria, from April 2014 to May 2014.

A total of 214 pupils attending Ikaledaran primary school Okada, Edo State, Nigeria were recruited for this study. Participant's age ranged from 5 years to 15 years and consisted of 98 females and 116 males. The purpose of research was explained to all the participants. In addition a letter was sent to all parents/guardians explaining same to them and seeking for their permission to include their children/ward in the study. A detailed questionnaire was also attached to letter from which some data of parents and pupils were gathered. On receipt of parents/guardians approval and filled questionnaire, pupils were given a sterile universal bottle with container and educated on how to collect the samples. The study was approved by the ethical committee of the Ikaledaran Primary School Okada, Edo State, Nigeria.

Collection and processing of urine samples

Urine samples were collected from school

children in well sterilized and well labeled universal containers with covers during school hours between 10:00h and 14:00h. The samples were immediately taken to the laboratory of Igbinedion University Teaching Hospital Okada, for analysis. The urine samples were processed as previously described¹. In brief, 10 mls of urine was placed in a test-tube and centrifuged at 5000rpm for 5 minutes. The supernatant was discarded and resulting sediment placed on a grease free slide and subsequently covered with a cover slip. The preparation was examined under light microscope for the presence of ova of *schistosoma heamatobium*. The slides were also examined for the presence of red blood cells cast. The presence of protein in urine was determined using reagent-strips (Medi-test Combi-9, manufactured by Machery-Hagel, Duren, Germany).

Results

The prevalence of urinary schistosomiasis among children was 5.6%. Although female were observed to have a higher prevalence of urinary schistosomiasis (10.2%) than their male counterparts (1.7%) the difference was not statistically significant ($P = 0.091$) (Table 1).

No visible blood was observed from macroscopic examination of urine samples. Micro-hematuria was however, observed in 11(5.1%) of samples collected. A total of 25 (11.7%) samples had the presence of protein. Neither micro-hematuria ($P = 0.478$) nor proteinuria ($P = 0.152$) were pathognomonic of urinary schistosomiasis in this study (Table 1).

With respect to age and religion, children aged 14 years and above and those of the Christian faith were observed to have the highest prevalence of urinary schistosomiasis respectively. However age and religion were not identified as risk factors for acquiring urinary schistosomiasis in this study (Table 2). History of bathing in flowing or stagnant river was associated with urinary schistosomiasis among children (OR =

Table 1: Prevalence of urinary schistosomiasis among children

Characteristics	N	No infected (%)	OR	95% CI	P value
<u>Gender</u>					
Female	98	8 (8.2)	2.489	0.726, 8.554	0.149
Male	116	4 (3.4)	0.402	0.117, 1.378	
<u>Micro-hematuria</u>					
Yes	11	1 (9.1)	1.745	0.205, 14.896	0.478
No	203	11 (5.4)	0.573	0.067, 4.889	
<u>Proteinuria</u>					
Yes	25	3 (12.0)	2.727	0.186, 10.840	0.152
No	189	9 (4.8)	0.367	0.092, 1.407	

N – Number of children examined; OR – odd ratio; CI – confidence interval

Table 2: Risk factors for acquisition of urinary schistosomiasis among children

Characteristics	N	No infected (%)	OR	95%CI	P value
<u>Age (Yrs)</u>					
5-7	45	2(4.4)			0.708
8-10	52	4 (7.7)			
11-13	70	2 (2.9)			
= 14	47	4 (8.5)			
<u>Religion</u>					
Christianity	189	11 (5.8)			0.592
Islam	23	1 (4.3)			
Paganism	4	0 (0.0)			
<u>Do you bath in River</u>					
Yes	147	10 (6.7)	2.372	0.505, 11.143	0.348
No	67	2 (2.9)	0.422	0.089, 1.980	
<u>Source of drinking water</u>					
Tap water	151	6 (3.9)			0.014
Well water	44	2 (4.5)			
River water	7	3 (42.8)			
Rain water	12	1(8.3)			
Characteristics	N	No infected (%)	OR	95% CI	P value
<u>Father`s occupation</u>					
Farming	56	2 (3.8)			0.012
Fishing	25	5 (16.0)			
Trading	110	4 (4.5)			
Civil Servants	21	1 (4.8)			
Clergy	2	0 (0.0)			
<u>Educational status of father</u>					
Tertiary	8	0 (0.0)			0.187
Secondary	74	2 (2.7)			
Primary	101	6 (5.9)			
No formal education	31	2 (12.9)			

N – Number of children examined

2.372, 95% CI = 0.505, 11.143). Although children that bath in river water had a higher prevalence of urinary schistosomiasis (6.2%) than those without such history (2.9%), the difference between both groups was not statistically significant ($P = 0.348$) (Table 2).

However children whose source of drinking water was the river were observed to have a significantly higher prevalence of urinary schistosomiasis than children with other sources of drinking water ($P < 0.014$) (Table 2).

Occupation of parents was identified as a risk factor for acquisition of urinary schistosomiasis in this study ($P = 0.012$). Children born to parents whose occupation was fishing had the highest prevalence of 16.0% (Table 2).

The prevalence of urinary schistosomiasis was observed to be highest among children born to parents with no formal education (12.9%) although educational status of parents did not significantly affect

the prevalence of urinary schistosomiasis among children studied (Table 2)

Discussion

Urinary schistosomiasis is endemic in Nigeria, but sadly one of the neglected common parasitic diseases of childhood in the country^{2,3}. It is a significant cause of clinical morbidity and mortality in endemic countries of Africa and Middle East³. Data on prevalence of urinary schistosomiasis in rural Okada community of Edo state Nigeria is missing. Against this background this study aimed at determining the prevalence of urinary schistosomiasis among primary school children

The prevalence of urinary schistosomiasis among school children was 5.6%. This is lower than 57.7%, 24.3%, 19.8% and 18.7% reported in other Nigerian studies^{19, 20, 21, 22}. It is however higher than 4.6% reported in a recent Nigerian study²³. The prevalence of

urinary schistosomiasis differs from place to place. It is worth mentioning that the difference could also be related to geographical location as documented in earlier conducted studies in south western Nigeria, north –eastern Nigeria, south- eastern Nigeria, north central Nigeria and south eastern Nigeria respectively in contrast to our study which was conducted in Mid Western Nigeria^{19, 20, 21, 22, 23}. The variation could also be due to differences in water contact pattern among participants of these studies. The prevalence of urinary schistosomiasis was observed to be higher among female children (82%) as compared to their male counterparts who recorded a prevalence of 3.4%. Similar findings have been documented in an earlier study²¹, with contrasting results obtained in others^{23, 24}. The higher prevalence of urinary schistosomiasis observed among females may not be unrelated to the fact that females are more likely to engage in domestic chores like fetching of water from the streams and washing of clothings in same. However gender did not significantly affect the prevalence of urinary schistosomiasis in this study. This is consistent with an earlier report²³.

Proteinuria and haematuria are indirect disease markers that are commonly used to identify individuals or communities at risk of *Schistosoma haematobium* infection in endemic rural African settings²⁵. Micro-haematuria and proteinuria were observed in 11(5.1%) and 25 (11. 7%) of total samples examined in this study. Unlike in an earlier study Ugbomoiko *et al.*, (2009) where proteinuria and haematuria were positively correlated with urinary schistosomiasis, neither micro-haematuria ($P = 0.478$) nor proteinuria ($P = 0.152$) were pathognomonic of urinary schistosomiasis in this study. Other covert or overt factors could result in the presence of blood and protein in urine. The presence of urinary tract infection can precipitate kidney damage and lead to protein leakage²⁵. This may well account for the observed trend in this study.

Children aged 14 years and above were observed to have the highest prevalence of urinary schistosomiasis. Children in same age group have been reported to have the highest prevalence in other studies^{21, 24, 26}. High water contact is a risk factor for acquiring urinary schistosomiasis²⁷. Younger children are much more likely to be in custody of their parents and may not enjoy as much freedom in engaging on self voyage to streams for bathing and swimming sessions as older children. This may explain the observed higher prevalence among older children in this study. The prevalence of urinary schistosomiasis was however not significantly affected by age of children. This agrees with findings in another Nigerian study²³, but disagrees with findings elsewhere^{24, 28}. Although children of the Christian faith were observed to have the highest prevalence of urinary schistosomiasis, religion was not

identified as a risk factor for acquisition of USI. This is consistent with an earlier report¹⁵.

The prevalence of USI was higher among children with history of bathing in the river. High water contact is a risk factor for acquiring urinary schistosomiasis^{2, 27}. In this study however, a history of river bathing was not identified as a risk factor for acquisition of urinary schistosomiasis. This is in contrast to report elsewhere²⁴. Other factors such as poor hygiene and proximity to water bodies have been reported to affect the prevalence of USI in an earlier study²⁹. The existing stream in Okada is located at some distance from human settlement. Perhaps the distance children may have to cover to get to the stream may discourage frequent visits which may have translated to the observed trend in this study. The prevalence of urinary schistosomiasis was significantly affected by participant's source of drinking water. Children with access to tap water had significantly lower prevalence than others who did not. Indeed the prevalence of urinary schistosomiasis was highest among the group of children whose source of drinking water was the river. This has been reported by another Nigerian study²⁹. In this study, source of drinking water was identified as a risk factor for acquisition of urinary schistosomiasis. This is in line with findings from other Nigerian studies^{24, 29}.

Children whose father's occupation was fishing recorded the highest prevalence of USI. This has been documented in previous Nigerian studies^{29, 30}. It is a common practice in Nigeria for children to assist their parents in carrying out their trade during or after school hours. Children of workers in river related occupation may frequently visit rivers leading to increased contact with ova, a factor that have been reported to be associated with acquisition of urinary schistosomiasis²⁷. Of all children examined, those whose father had no formal education were observed to have the highest prevalence of urinary schistosomiasis. This has been previously documented in an earlier study³. Poverty and lack of education breeds ignorance. Parents with no education may be completely oblivious of risk factors of acquiring urinary schistosomiasis and thus be unable to pass vital preventive health information to their children. However educational status of parents of children was not identified as a risk factor for urinary schistosomiasis. This agrees with findings from a previous study³, but differs from others^{15, 29}.

Conclusively the prevalence of urinary schistosomiasis in this study was 5.6%. Participants source of drinking water, occupation of father, and type of toilet system used significantly affected the prevalence of urinary schistosomiasis among children. Findings from this study underscore the need for provision of basic social amenities for residents of

Okada community to curb the spread of schistosomiasis. There is also need for public enlightenment on mode of transmission and prevention of urinary schistosomiasis in rural communities of Edo State, Nigeria.

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Conflict Of Interest:

Authors have no conflict of interest to declare

References

1. Akinbo, F.O., Okaka, C.E., Omoregie, R. Proportion of Urinary Schistosomiasis among HIV-Infected Subjects in Benin City, Nigeria. *Oman Med J*, 2011; 26(3): 175-177
2. Adeyeba, O.A., Ojeaga, S.G.T. Urinary schistosomiasis and concomitant urinary tract pathogens among school children in metropolitan Ibadan, Nigeria. *Afr J Biomed. Res*, 2002; 5: 103–107.
3. Houmsou, R.S., Amuta, E.U., Sar, T.T. Profile of an epidemiological study of urinary schistosomiasis in two local government areas of Benue state, Nigeria. *Inter J Med Biomed Res*, 2012; 1(1):39-48
4. Brindley, P.J., Hotez, P.J. Break Out: Urogenital Schistosomiasis and *Schistosoma haematobium* Infection in the Post-Genomic Era. *PLoS Negl Trop Dis* 2013; 7(3): e1961. doi:10.1371/journal.pntd.0001961
5. King, C.H. Parasites and poverty: the case of schistosomiasis. *Acta Trop* 2013; 113: 95–104
6. Van der Werf, M.J., de Vias, S.J., Brooker, S., Looman, C.W., Nagelkerke, N.J., Habbema, J.D., Engels, D. Quantification of clinical morbidity associated with schistosoma infection in Sub-Saharan Africa. *Acta trop*, 2003; 86(2-3): 125
7. Shiff, C., Veltri, R., Naples, J., Quartey, J., Otchere, J., Anyan, W., Marlow, C., Wiredu, E., Adiei, A., Brakohiapa, E., Bosompem, K. Ultrasound verification of bladder damage is associated with known biomarkers of bladder cancer in adults chronically infected with *Schistosoma haematobium* in Ghana. *Trans R Soc Trop Med Hyg*, 2006; 100: 847–854.
8. Botelho, M.C., Machado, J.C., Brindley, P.J., Correia da Costa, J.M. Targeting molecular signaling pathways of *Schistosoma haematobium* infection in bladder cancer. *Virulence* 2011; 2: 267–279
9. Hotez PJ, Fenwick A, Kjetland EF Africa's 32 cents solution for HIV/AIDS. *PLoS Negl Trop Dis* 2009; 3: e430. doi:10.1371/journal.pntd.0000430.
10. Mbabazi, P.S., Andan, O., Fitzgerald, W., Chitsulo, L., Engels, D., Downs, J.A. Examining the relationship between urogenital schistosomiasis and HIV infection. *PLoS Negl Trop Dis* 2011; 5: e1396. doi:10.1371/journal.pntd.0001396
11. Kjetland, E.F., Leutscher, P.D., Dndhlovu, P.D. A review of female genital schistosomiasis. *Trends Parasitol* 2012; 28: 58–65
12. Rinaldi G, Okatcha TI, Popratiloff A, Ayuk MA, Suttiprapa S, Mann VH, Liang YS, Lewis PA, Loukas A., Brindley PJ Genetic manipulation of *Schistosoma haematobium*, the neglected schistosome. *PLoS Negl Trop Dis* 2011; 5: e1348. doi:10.1371/journal.pntd.0001348.
13. Rollinson, D.A. Wake up call for urinary schistosomiasis: reconciling research effort with public health importance. *Parasitol* 2009; 136: 1593–1610
14. Kapito-Tembo, A.P., Mwapasa, V., Meshnick, S.R., Samanyika, Y., Banda, D., Bowie, C., Radke, S. et al. Prevalence Distribution and Risk Factors for *Schistosoma haematobium* Infection among School Children in Blantyre, Malawi. *PLoS Negl Trop Dis* 2009; 3(1): e361. doi:10.1371/journal.pntd.0000361
15. Awoke, W., Bedimo, M., Tarekegn, M. (2013). Prevalence of schistosomiasis and associated factors among students attending at elementary schools in Amibera District, Ethiopia. *Open J Prev Med* 2013; 3: 199-204.
16. Imoh, A.N., Isaac, K.J., Nwanchukwu, E.O. Comparative analysis of poverty status of Community participation in rural Development Projects of Akwa-Ibom State, Nigeria. *New York Sci J* 2009; 2 (6):68-75
17. Aderamo, A.J., Magaji, S.A. Rural transportation and the distribution of public facilities in Nigeria: A case of Edu Local Government Area of Kwara State. *J Human Ecol*, 2010; 29 (3):171-179
18. National Population Commission. Population and Housing Census of the Federal Republic of Nigeria 2006; Available from www.population.gov.ng
19. Okpara, K.N., Udoidung, N.I., Ukpog, I.G. Genitourinary schistosomiasis among primary school children in a rural community within the Cross-river basin, Nigeria. *J Helminthol* 2007; 81:393-397
20. Biu, A.A., Kolo, H.B., Agbadu, E.T. Prevalence of *Schistosoma haematobium* infection in school aged children of Konduga Local Government Area, Northeastern Nigeria. *Inter J Biomed Health Sci* 2009; 5(4):181-184
21. Ekpo, U.F., Laja-Deile, A., Oluwole, A.S., Sam-Wobo, S.O., Mafiana, C.F. (2010). Urinary schistosomiasis among preschool children in a rural

- community near Abeokuta, Nigeria. *Parasites & Vectors* 2010; 3:58 doi:10.1186/1756-3305-3-58
22. Ejima, I.A.A., and Odaibo A.B. Urinary schistosomiasis in the Niger-Benue basin of Kogi State Nigeria. *Inter J Trop Med* 2010; 5:73-80
23. Okeke, O.C., Ubachukwu, P.O. Urinary Schistosomiasis in Urban and Semi-Urban Communities in South-Eastern Nigeria *Iranian J Parasitol* 2013; 8(3): 467-473
24. Senghor, B., Diallo, A., Sylla, S.N., Doucouré, S., Ndiath, M.N., Gaayeb L, Djuikwo-Teukeng, F.F., Ba, C.T., Sokhna, C. Prevalence and intensity of urinary schistosomiasis among school children in the district of Niakhar, region of Fatick, Senegal. *Parasites & Vectors* 2014; 7:5
25. Houmsou, R.S., Amuta, E.U., Wama, B.E., Hile, T.D. Proteinuria as a Morbidity Marker of Urinary Schistosomiasis in School Children Living in Onchocerciasis Endemic Areas of Benue State, Nigeria. *Inter J Life Sci Med Res* 2013; 3(6):246-249
26. Deribe, K., Eldaw, A., Hadziabduli, S., Kailie, E., Omer, M.D., Mohammed, A.E., Jamshed, T., Mohammed, E.A., Mergani, A., Ali, G.A., Babikir, K., Adem, A., Hashim, F. High prevalence of urinary schistosomiasis in two communities in South Darfur: implication for interventions. *Parasit Vectors* 2011, 4:14
27. Mazigo, H.D., Nuwaha, F., Kinung'hi, S.M., Morona, D., Pinot de Moira, A., Wilson, S., Heukelbach, J., Dunne, DW. Epidemiology and control of human schistosomiasis in Tanzania. *Parasites & Vectors* 2012; 5:274
28. Briand, V., Watier, L., Le Hesran, J.Y., Garcia, A., Cot, M. Co-infection with plasmodium falciparum and Schistosoma haematobium: protective effect of schistosomiasis on malaria in Senegalese children? *Am J Trop Med Hyg* 2005; 72:702–707.
29. Ugbomioko, U.S., Ofoezie, I.E., Okoye. I.C., Heukelbach, J. Factors associated with urinary schistosomiasis in two peri-urban communities in south-western Nigeria. *Ann Trop Med Parasitol* 2010; 104 (5): 409–419
30. Okwori, A.E.J., Sidi, M., Ngwai, Y.B., Obiekezie, S.O., Makut, M.D., Chollom, S.C., Okeke, IO., Adikwu, TI. Prevalence of Schistosomiasis among Primary School Children in Gadabuke District, Toto LGA, North Central Nigeria. *British Microbiol Res J* 2014; 4(3): 255-261

Knowledge and Uptake of Human Papilloma Virus Vaccine for Prevention of Cervical Cancer Among Secondary School Females in Ogbomoso, South West Nigeria.

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Abstract

Cervical Cancer is a major public health problem globally, with majority of cases occurring in the developing world especially sub-Saharan Africa. This region is also affected by the burden of ignorance, poverty and poor access to basic education which has further worsened the fate of those affected by cervical cancer. This was a cross-sectional descriptive study carried out among senior secondary school females in Ogbomoso, South west Nigeria. Information was obtained using pretested questionnaires. One hundred and twelve (36.5%) of the three hundred and seven respondents have heard about cervical cancer, sixty three (20.5%) have heard about cervical cancer vaccine while twenty (6.5%) of the respondents have received human papilloma virus (HPV) vaccine for prevention of cervical cancer prior to the conduct of the study. Awareness of cancer of the cervix, HPV infections and HPV vaccine is low among female secondary school students in Ogbomoso. Hence, improvement in knowledge and uptake of HPV vaccination of our young girls will go a long way in prevention of cervical cancer.

Key words- Cervical cancer, Human papilloma virus, Vaccine

Introduction

Cervical Cancer is a major public health problem globally. Over 560,000 new cases and about 275,000 deaths are recorded each year, with more than 55% occurring in developing countries.¹ It is the most common gynaecological cancer among women in sub-Saharan Africa.² It is estimated that 70,722 new cases of invasive cervical cancer occur annually in sub-Saharan Africa.³

Worldwide, 15% of all cancer cases and nearly 26% of cancer cases in developing countries are attributable to infectious agents, particularly viruses.⁴

Cervical cancer, which is caused by the human papilloma virus (HPV), is the leading cause of cancer mortality among women in sub-Saharan Africa.⁵ The approval and recommendation of two vaccines – Gardasil and Cervarix – provide a huge opportunity to curb the burden of cervical cancer.⁶

The introduction of vaccines has been one of the most effective public health interventions for combating infectious diseases.^{7,8} Significant success has been achieved in the developed countries with regards to cervical cancer prevention however obvious barriers to achieving similar level of success exist in low-income countries. These barriers include the high cost of vaccine and vaccine delivery, low cervical cancer screening levels, incapable and poor health system capabilities, reduced access to medical care and medical facilities, low awareness and knowledge of HPV and cervical cancer.⁹⁻¹⁶ Government and the citizen alike have to recognize cervical cancer as a major health problem.¹⁷ Significant effort have been made in reducing the burden of cervical cancer through health education and advocacy; however, the need for legislation to ensure far reaching success may be necessary. This effort should not be limited to vaccines promotion alone but should also be extended to cervical cancer screening.

This study aimed to find out the level of knowledge of female secondary school students about cervical cancer, HPV vaccine and their willingness to use the vaccine as a means of preventing cervical cancer.

Methodology

This is a cross-sectional descriptive study carried out among female senior secondary school students in Ogbomoso, South west Nigeria. The participating secondary schools were the government owned secondary schools and the schools involved in the pretesting of questionnaires and the study were chosen by the ballot and this was done randomly. Three hundred and seven female students of the senior secondary schools selected randomly by ballot. The study instrument was a self administered questionnaire which had been pre-tested in a government owned secondary school before the conduct of the study, this school was not involved in the study subsequently. The questionnaire was simple to understand. Female students in the schools were eligible to participate in the study. Participation was voluntary and informed

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consent was obtained from the students prior to the administration of the questionnaire. The information required included age of respondents, educational background of parents, religion, the knowledge of cervical cancer and HPV vaccine and their use of the vaccine. Analysis was done with SPSS 20, statistical significance was at ≤ 0.05

Results

A total of four hundred and twenty eight questionnaires were administered. Three hundred and seven questionnaires were completely filled and suitable for analysis hence the response rate was 71.7%. The age range of these responders was from 12 to 22 years; the modal age was 15 and it accounted for ninety (29.4%) of the responders. One hundred and twelve (36.5%) of the responders have heard about cervical cancer, while only 63 (20.5%) have heard about cervical cancer vaccine. Of these number 30 (47.6%) got the information from the medical personnel while the other major source of information on cervical cancer prevention vaccine was the mass media which accounted for nineteen (30.2%) of those that have heard about the vaccines.

Only 20 (6.5%) of the responders had received the vaccine at the time of conducting this study. Thirteen of them (65%) received the vaccine from health centres like Teaching, General or private hospitals while the other 7 (35%) received from

Table 1. Relationship between mothers education level and knowledge of HPV vaccine among their daughters.

Mothers education level	Knowledge of HPV vaccine	No prior knowledge of HPV vaccine
No formal education	0	2
Primary education	0	12
Secondary education	15	68
Tertiary education	48	151

P value=0.043

Table 2. Relationship between fathers' education level and knowledge of HPV vaccine among their daughters.

Fathers education level	Knowledge of HPV vaccine	No prior knowledge of HPV vaccine
No formal education	0	0
Primary education	0	7
Secondary education	13	51
Tertiary education	48	158

P value=0.31

Table 3. Relationship between knowledge of HPV vaccine and its uptake among female secondary school students.

Knowledge of HPV vaccine	Uptake of HPV vaccine	No prior uptake of HPV vaccine
Prior knowledge of HPV vaccine	9	50
No prior knowledge of HPV vaccine	4	226

P value=0.001

religious groups in the church.

Among the 287 (93.5%) students who had not received the vaccine, their reasons for non uptake varied from not knowing about the vaccine, not knowing where to access it, to being scared of the associated possible side effects of the vaccine.

Majority of the mother of the respondents i.e two hundred (65.1%) had attained tertiary education while two hundred and forty seven fathers (80.5%) had attained tertiary education. There was a significant relationship between mother's level of education and knowledge of cervical cancer prevention vaccine among the students ($p=0.043$) Table 1. However there was no significant relationship between the knowledge about cervical cancer prevention vaccine among female students and their fathers' education level ($p=0.31$) Table 2.

When the students were considered there was a significant relationship between the knowledge of HPV vaccine and vaccination against cervical cancer among them ($p=0.001$) Table 3.

Discussion

This study revealed that the awareness and uptake of cervical cancer prevention vaccine is low in Ogbomoso. This finding is similar to those obtained in other local studies.¹⁸⁻²⁰ The knowledge of a teenager is largely influenced by parents, peers, teachers, social media etc. The implication of this is that parents, teachers and peers of these students lack knowledge on cervical cancer prevention using vaccine.

Parents, especially mothers have been known to play crucial roles in making informed decision for their daughters. Hence, we need parental acceptance of the vaccines.²¹ It can be deduced further that there cannot be parental acceptance if the mothers don't have adequate knowledge and are not aware of these vaccines.²¹ Some parents think that HPV vaccination is unnecessary as such they are worried about its safety and adverse reactions whereas others have concern that HPV vaccination may cause an increase in sexual activity amongst their daughters.²² Hence, a lot has to be done to enlighten these individuals to talk about prevention with a focus on health promotion strategies to educate the public about cervical cancer prevention.

From the result of our study, there was a significant relationship between mother's level of education and knowledge of cervical cancer prevention vaccine among their daughters ($p=0.043$) Table 1. This further emphasizes the need for a girl child education early in life as this will help in improving her ability to influence decisions positively as they may concern herself and her family.

There was however no significant relationship between the knowledge about cervical cancer

prevention vaccine among female students and their father's education level ($p=0.31$) Table 2. Nevertheless, this finding does not exclude the father from helping in improving knowledge and awareness about HPV vaccines for prevention of cervical cancer.

In conclusion, awareness of cancer of the cervix, HPV infections and HPV vaccine is low among female secondary school students in Ogbomoso. Improvement in knowledge and uptake of HPV vaccination among young girls will go a long way in prevention of cervical cancer. Focus should be on education of the girl child and health promotion awareness through teachers, peers and the social media to enhance the current level of knowledge and uptake of the vaccine.

Education should aim at improving the current level of knowledge of cervical cancer prevention among the members of the society with the aim of dispelling factors that may be associated with poor uptake of the vaccines.

Recommendation

Efforts should also be made to further subsidize the cost of the vaccine and improve its availability in our health care facilities. This can be done by the political will on the part of the Government, non-governmental organizations and the citizens as a whole.

References

1. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer in 2008. GLOBOCAN 2008. *Int J Cancer*. 2010;127:2893–917.
2. Louie KS, de Sanjose S, Mayaud P. Epidemiology and prevention of human papilloma virus and cancer in sub-Saharan African: A comprehensive review. *Trop Med Int Health*. 2009;14:1287–302
3. Parkin DM, Sitas F, Chirenje M, Stein L, Abratt R, Wabinga H. Cancer in Indigenous Africans-burden, distribution and trends. *Lancet Oncol*. 2008;9:683–92
4. Parkin DM. The global health burden of infection-associated cancers in the year 2002. *Int J Cancer* 2006; 118:3030–3044
5. Jemal A, Bray F, Center MM, Ferlay J, Ward E, *et al*. Global cancer statistics. *CA Cancer J Clin*. 2011; 61:69–90
6. Markowitz LE, Dunne E, Saraiya M, Lawson H, Chesson H, *et al*. Quadrivalent human papillomavirus vaccine. Morbidity and Mortality weekly report 2007; 56:1–24
7. Chauke-Moagi BE, Mumba M. New vaccine introduction in the East and Southern African sub-region of the WHO African region in the context of GIVS and MDGs. *Vaccine* 2012; 30: C3–C8
8. Levine OS, Bloom DE, Cherian T, de Quadros C, Sow S, *et al*. The future of immunisation policy, implementation, and financing. *The Lancet* 2011; 378:439–448.
9. Agosti JM, Goldie SJ. Introducing HPV vaccine in developing countries-key challenges and issues. *N Engl J Med*. 2007; 356:1908–1910.
10. Gakidou E, Nordhagen S, Obermeyer Z. Coverage of cervical cancer screening in 57 countries: low average levels and large inequalities. *PLoS medicine* 2008; 5: e132.
11. Sitas F, Parkin M, Chirenje Z, Stein L, Mqoqi N, *et al*. Disease and mortality in sub-Saharan Africa. World Bank-free PDF. 2006
12. Francis SA, Nelson J, Liverpool J, Soogun S, Mofammere N, *et al*. Examining attitudes and knowledge about HPV and cervical cancer risk among female clinic attendees in Johannesburg, South Africa. *Vaccine* 2010; 28: 8026–8032
13. Ayissi CA, Wamai RG, Oduwo GO, Perlman S, Welty E, *et al*. Awareness, Acceptability and Uptake of Human Papilloma Virus Vaccine Among Cameroonian School-Attending Female Adolescents. *J Community Health*. 2012; 37: 1127–1135
14. Chan ZC, Chan TS, Ng KK, Wong ML. A Systematic Review of Literature about Women's Knowledge and Attitudes toward Human Papillomavirus (HPV) Vaccination. *Public Health Nurs* 2012; 29: 481–489
15. Wamai RG, Ayissi CA, Oduwo GO, Perlman S, Welty E, *et al*. Assessing the effectiveness of a community-based sensitization strategy in creating awareness about HPV, cervical cancer and HPV vaccine among parents in North West Cameroon. *J community health* 2012; 37: 917–926
16. Wamai RG, Ayissi CA, Oduwo GO, Perlman S, Welty E, *et al*. Awareness, knowledge and beliefs about HPV, cervical cancer and HPV vaccines among nurses in Cameroon: an exploratory study. *Int J Nurs Stud* 2013; 50: 1399–1406
17. Louie KS, De Sanjose S, Mayaud P. Epidemiology and prevention of human papillomavirus and cervical cancer in sub-Saharan Africa: a comprehensive review. *Trop Med Int Health* 2009; 14: 1287–1302
18. Odetola TD, Ekpo K. Nigerian Women's perceptions about human papilloma virus immunizations. *J Community Med Health Educ*. 2012; 2:191.
19. Ezenwa BN, Balogun MR, Okafor IP. Mothers' human papilloma virus knowledge and willingness to vaccinate their adolescent daughters in Lagos, Nigeria. *Int J Womens Health*. 2013; 5: 371–377.
20. Makwe CC, Anorlu RI. Knowledge of and attitude towards human papilloma virus infection and vaccines among females nurses at a tertiary hospital in Nigeria. *Int J Womens Health*. 2011; 3: 313–317.
21. Chase DM, Tewari KS. Update on cervical cancer screening. *Female Patient*. 2010; 35: 16–21.
22. Darden PM, Thompson DM, Roberts JR, Hale JJ, Pope C, Naifeh M, *et al*. Reasons for not vaccinating adolescents: National Immunization Survey of Teens, 2008–2010. *Paeditrics*. 2013; 131: 645–651.

Practice Of Female Genital Cutting Amongst Adults In Ilorin Metropolis, North-Central Nigeria

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Abstract

Female genital cutting (FGC) is recognized internationally as a violation of human rights. About 140 million girls and women worldwide are living with the consequences of FGC and about 92 million girls aged 10 years and above are estimated to have undergone FGC. In Nigeria, FGC is of public health importance because of its high prevalence and association with maternal and child morbidity and mortality. The study set out to determine the practice of FGC amongst adults in Ilorin metropolis, north-central Nigeria.

This descriptive cross sectional survey was carried out in Ilorin metropolis amongst 1,000 household heads and their spouses recruited using a multi stage sampling technique. A pretested semi-structured interviewer-administered questionnaire was the data collection instrument used. Data was analyzed using the EPI-INFO version 3.5.1 statistical package. Data were presented using frequency distribution tables and charts. Cross tabulations of important variables were done. Chi-square test was used to determine the statistical difference in observation where necessary. A P value < 0.05 was considered significant at 95% confidence level.

The mean age of the respondents was 35.7(±13.6) years and about half of them 947 (47.4%) were between the ages of 30 and 39 years. Almost all the respondents were married (93.4%). More than half of the households 570 (57%) practiced female genital cutting. Majority 524 (92%) of the female genital cutting was done by a traditional practitioner. Slightly more than half of the respondents 247 (50.4%) practiced FGC as a form of religious obligation while just a few 55 (9.6%) practiced it to ease childbirth. There was a statistically significant association between socio-demographic variables and practice of female genital cutting (p values < 0.05).

Majority of the respondents in the study area practiced FGC and they hold a lot of misconceptions about the effect of FGC. Concerted efforts of stakeholders to curb the menace will have beneficial effects on children yet unborn.

Key words: North-central Nigeria, practice, Female Genital Cutting

Introduction

Female genital cutting (FGC) comprises all procedures that involve partial or total removal of the external female genitalia, or other injuries to the female genital organs for non-medical reasons. The practice is mostly carried out by traditional circumcisers, who often play other central roles in communities, such as attending childbirths. FGC is recognized internationally as a violation of the human rights of girls and women.¹

In some countries, there has been a reduction of the average age at which a girl is subjected to the procedure.² This could be to some extent the result of anti-FGC legislation: the younger the girl, the easier it is to elude legal scrutiny. One encouraging trend seen consistently in countries for which data from at least two surveys are available is that women aged 15–19 years are less likely to have been subjected to FGC than are women in older age groups. In almost all of these countries, support for the discontinuation of the practice is particularly high among younger women²

Communities have reasons for practising FGC which include sociocultural reasons (such as ensuring girls' virginity and hence the family's honour), hygienic and aesthetic reasons (to make girls hygienically clean), spiritual and religious reasons (wrongly believing that it is required by their religion), and psychosexual reasons (to control the sex drive of uncircumcised girls).³ Female genital cutting and its complications are completely preventable. However, it is not easy to change traditions which have been practised for a long time. Hence, raising peoples' awareness will go a long way in the prevention.³

Female genital cutting is practiced in at least 26 of 52 African countries⁶; the prevalence varies from 98% in Somalia to 5% in Zaire. A review of country-specific Demographic and Health Surveys (DHS) shows FGC prevalence rates of 97% in Egypt⁷, 94.5% in Eritrea⁵, 93.7 % in Mali⁸, 89.2 % in Sudan⁹, and 43.4 % in the Central African Republic.¹⁰ It is estimated that over 100 million girls and women have undergone some form of genital cutting, and at least two million girls are at risk of undergoing the practice every year. In Africa, about three girls are at risk for FGC annually. About 140 million girls and women worldwide are living with the consequences of FGC and about 92

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million girls age 10 years and above are estimated to have undergone FGC¹ The practice is most common in the western, eastern, and north-eastern regions of Africa, in some countries in Asia and the Middle East, and among migrants from these areas.¹ FGC is of public health importance in developing countries such as Nigeria because of its high prevalence and association with maternal and child morbidity and mortality. However, more than 18% of all FGC is performed by health care providers, and this trend is increasing⁵

FGC, as a traditional practice, is harmful to women and inflict both immediate and long-term mental and physical pain on the victims. The practice exposes women to sickness and death from haemorrhage, infection, keloid formation, and consequent obstructed labour. The practice of FGC has been found to have physical, psychological, psychosexual and health implications on the victims. The study specifically assessed the practice of Female Genital cutting amongst adults in Ilorin metropolis.

Methodology

The study was conducted in Ilorin metropolis, one of the largest cities in Nigeria and is the capital of Kwara State. As of 2007, it had a population of 847,582.¹¹ Ilorin was founded by the Yoruba, one of the three largest ethnic groups in Nigeria. In 1450, It became a provincial military headquarters of the ancient Oyo Empire. Although, the city retains a strong Islamic influence from the Northern incursions, Christianity is widely practiced by significant portions of other Nigerians originating from other states.¹² There are three main local government areas (LGA) in Ilorin metropolis, Ilorin west, Ilorin south, Ilorin east, comprising of twelve, eleven and twelve wards respectively and many communities.⁹

The study was a descriptive cross sectional survey carried out from October 2012 to March, 2013. One thousand household heads and their spouses in thirty six communities from 12 wards from the three LGAs in Ilorin metropolis formed the study population. The sample size was estimated using the Fisher's formula¹³ using 40% prevalence of FGC from a previous study.¹ A minimum sample size of 368 was calculated but 2000 subjects were recruited into the study to increase the power and reliability of the study.

Multistage sampling was used in selecting respondents for the study. A semi-structured interviewer-administered questionnaire was used to collect information from the subjects. The questionnaire contained relevant information on the knowledge and perception of respondents on FGC. The research instrument was pre-tested among adults in Afon town in Asa LGA, a town located about 15 kilometers from Ilorin. This was to ensure validity and reliability of the instrument. Respondents were

anonymous and Informed consent was obtained from them. Ten Research assistants made up of students of tertiary institution were trained for the purpose of data collection. All collected data was collated and checked manually for error before entering into computer. Data was analyzed using the EPI –INFO version 3.5.1 statistical package. Data were presented using frequency distribution tables and charts. Cross tabulations of important variables was done. Chi-square test was used to determine the statistical difference in observation where necessary. A P value < 0.05 was considered significant at 95% confidence level.

Results

The mean age was 35.7(±13.6) years. About half of the respondents 947 (47.4%) were between the ages of 30 and 39 years. Majority of the respondents 1213 (60.8%) were females while distribution by religion showed that majority 1532 (76.6%) of the respondents were Muslims. With regards to ethnicity, majority of the respondents were Yoruba 1718 (85.9%) and about 92.3% of the respondents had at least primary education. Almost all the respondents were married (93.4%) while polygamy is the most common form of marriage practiced (75%). (table1). More than half of the households (57%) practiced female genital cutting (fig 1). Majority (79.1%) of the cutting was done at the traditional excissor's home (fig 2). Majority (92%) of the female genital cutting was done by a traditional

Practice of Female Genital Cutting among households

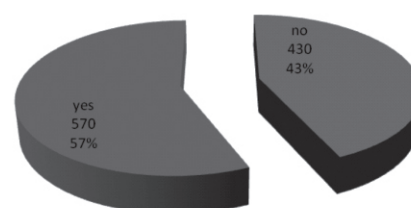


Figure 1: Female Genital Cutting among households

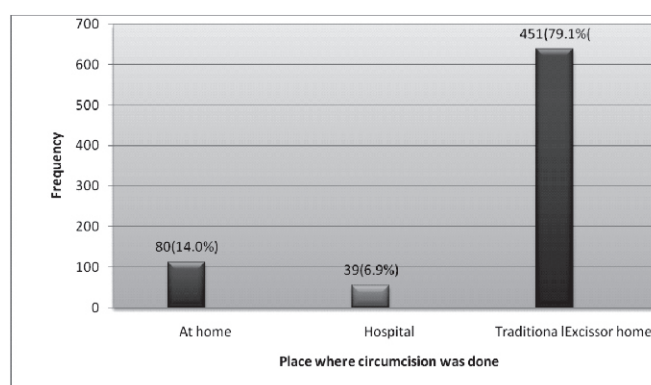


Figure 2: Place where circumcision was done

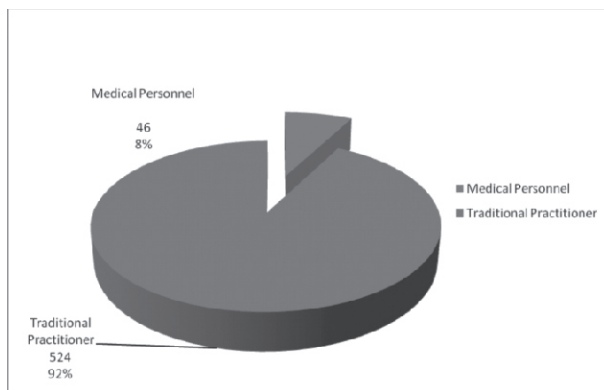


Figure 3: Personnel that carried out Female Genital Cutting

TABLE 1: SOCIO-DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

Socio-demographic data (n=2000)	Frequency	(%)
Age in years		
<20	20	(1.0)
20-29	221	(11.1)
30-39	947	(47.4)
40-49	613	(30.6)
50-59	103	(5.1)
=60	96	(4.8)
Mean+Sd = 35.7±13.6		
Sex		
Male	787	(39.2)
Female	1213	(60.8)
Religion		
Islam	1532	(76.6)
Christianity	326	(16.3)
Traditional	142	(7.1)
Ethnic Group		
Yoruba	1718	(85.9)
Igbo	74	(3.7)
Hausa	92	(4.6)
Others	116	(5.8)
Educational Status		
No formal Education	154	(7.7)
Primary	338	(16.9)
Secondary	982	(49.1)
Post Secondary	526	(26.3)
Marital Status		
Single	52	(2.6)
Married	1868	(93.4)
Divorced	29	(1.5)
Separated	14	(0.7)
Widowed	37	(1.8)
Type of Marriage		
Monogamous	467	(25.0)
Polygamous	1401	(75.0)

Table 2: Respondents Reasons for Practicing FGC

Factors*	Frequency	(%)
It is a religious obligation	287	(50.4)
FGC is a must in one's tribe	220	(38.6)
To ensure virginity	191	(33.5)
To please the man sexually	89	(15.7)
Pressure from society	78	(13.6)
To ease childbirth	55	(9.6)

* multiple responses N=570

practitioner (fig 3). Approximately half of the respondents (50.4%) practiced FGC as a form of religious obligation while just a few (9.6%) practiced it to ease childbirth (table 2). There was a significant association between socio-demographic variables and practice of female genital cutting except for the marital status -p values <0.05 - (table 3).

Discussion

In this study majority of the respondents 47.4% were between the ages of 30-39 years. Sixty one percent were female and most of them belonged to Islamic faith (76.6%). This can explain why more than half of the households interviewed practiced FGC as it is thought by many as a religious obligation.¹¹ Eighty five percent of the respondents were Yoruba and 49% had attained secondary school education, this however made communication easier. More than half (57%) of the household practiced FGC. This is more on the average when compared to a nationwide study that revealed prevalence of FGC practice varying widely; 5% in Taraba, 20% in Yobe, 80% in Kano and 95% in Katsina.¹⁴ When compared with the national prevalence of 40% in Nigeria¹⁰, it can be said that in this part of the country people still hold firm to their belief that the practice continue despite legislations.

In this study, most of the cutting was done in the traditional practitioner's home (79%) this is similar to a report published by the United States Department for Women and Health³¹ but however differ from a study in Egypt where 90% of FGC was performed by health professionals.¹² As such more complications in terms of infections is expected from our method of FGC despite many of the respondents (63.1%) claiming that the instruments used were sterilized.

The most experienced complication among respondents was severe bleeding (56.5%) while they also experienced painful menstrual period, painful intercourse and urinary incontinence. This was consistent with a study which revealed that 40% of the respondents who had had FGC regretted the act due to its medical complication.¹⁵ However, these complications did not seem to bother them as it marks for them strict following of religious injunctions despite absence of link between FGC and Islam.¹⁶⁻¹⁷

This study showed that majority (70.3%) of the households practiced FGC because of culture and tradition while others (43.9%) do so to prevent a girl

Table 3: Relationship between socio-demographic characteristics and practice of FGC

Socio-demographic data	PRACTICE OF FGC			- ²	df	p value
	YES N=570(%)	NO N=430(%)	TOTAL N=1000			
Age in years						
<20	3 (30.0)	7 (70.0)	10 (100.0)			
20-29	52 (46.8)	59 (53.2)	111 (100.0)			
30-39	261 (55.1)	213 (44.9)	474 (100.0)	21.023	5	0.0008
40-49	183 (59.6)	12 (40.4)	307 (100.0)			
50-59	34 (65.4)	18 (34.6)	52 (100.0)			
=60	37 (80.4)	9 (19.6)	46 (100.0)			
Religion						
Islam	435 (56.8)	331 (43.2)	766 (100.0)			
Christianity	73 (44.8)	90 (55.2)	163 (100.0)	36.567	2	0.0000
Traditional	62 (87.3)	9 (12.7)	71 (100.0)			
Ethnic Group						
Yoruba	504 (58.7)	355 (41.3)	859 (100.0)			
Igbo	6 (16.2)	31 (83.8)	37 (100.0)			
Hausa	38 (82.6)	8 (17.4)	46 (100.0)	46.913	3	0.0000
Others	22 (38.0)	36 (62.0)	58 (100.0)			
Educational Status						
No formal Education	62(80.5)	15(19.5)	77(100.0)			
Primary	103(60.9)	68(39.1)	169(100.0)			
Secondary	252(51.3)	239(48.7)	491(100.0)	25.046	3	0.0000
Post Secondary	153 (58.2)	110(41.8)	263(100.0)			
Marital Status						
Single	9(34.6)	17(65.4)	26(100.0)			
Married	532(57.0)	402(43.0)	934(100.0)	9.256	4	0.0549
Divorced	10(71.4)	4 (28.6)	14 (100.0)			
Separated	5(71.4)	2(28.6)	7 (100.0)			
Widowed	14(73.7)	5 (26.3)	19 (100.0)			
Type of Marriage						
Monogamous	102(43.8)	131 (56.2)	233(100.0)			
Polygamous	454(64.8)	247 (35.2)	701(100.0)	31.970	1	0.0001
Occupation						
Civil Servant	239(54.1)	203(45.9)	442(100.0)			
Trading	222(59.8)	149 (40.2)	371(100.0)			
Artisan	43(60.6)	28 (39.4)	71 (100.0)	13.678	5	0.0177
Unemployed	13(36.1)	23 (63.9)	36 (100.0)			
Farming	21(75.0)	7 (25.0)	28 (100.0)			
Others	32(61.5)	20 (38.5)	52(100.0)			
Number of Female children						
Nil	12 (35.3)	22 (64.7)	34 (100.0)			
1-4	330(60.3)	217 (39.7)	54 (100.0)	4.825	2	0.0898
>4	228(54.4)	191(45.6)	419(100.0)			

child from being promiscuous later in life. This is just a little more than 54% of respondents who attributed the practice to tradition and it is consistent with 44% who thought it controlled the sexual behavior of girls.¹⁸

In this study, about 59% of the respondents felt it was a religious obligation to carry out FGC, this is however consistent with the finding that in the countries where the practice exist, most women believed that as good Muslims, they have to undergo the procedure in order to be clean and proper.¹¹ In contrast to studies where medical form of FGC has

been reported; 94% of women in Egypt, 76% in Yemen, 65% in Mauritania,² only 8% of the studied households had their FGC done by medical personnel. While FGC done by medical personnel may reduce some complications; it may actually hinder the progress of long-term solution for curbing the practice of FGC. Female genital cutting has been recognized as a major public health problem for a number of years now and it still poses a major health problem in this part of the world. Efforts to stop the menace need to be intensified.

Conclusion and Recommendation

More than half of the respondents practiced FGC and there were misconception about the effects of FGC. Efforts to control FGC will have beneficial effects on children yet unborn with adequate information to their parents. Health workers need to participate more in this as they were cited as the most useful source of information. It is however of great importance to provide forum where health workers can inform the community and increase their awareness and knowledge about the effects of FGC in order to curb the practice. The government both at the state and federal level should make provision for laws against FGC and enforcement of the laws should be paramount.

References

1. WHO,WHO FACTS SHEET 2012,www.who.ng.com.assessed,May.2012
2. Yoder PS, Abderrahim N, Zhuzhuni A. *Female genital cutting in the Demographic Health Surveys: a critical and comparative analysis*. Calverton, MD: ORC Marco; 2004 (DHS Comparative Reports No. 7).
3. Demographic and Health Survey - Eritrea. (1995). Calverton, MD: Macro International Inc. pp. 166.
4. Demographic and Health Survey - Egypt. (1995). Calverton, MD: Macro International Inc. pp. 171.
5. Demographic and Health Survey - Mali. (1995). Calverton, MD: Macro International Inc. pp. 186.
5. Demographic and Health Survey - Sudan. (1989-1990). Calverton, MD: Macro International Inc. pp. 118.
6. Demographic and Health Survey - Central African Republic. (1995). Calverton, MD: Macro International Inc. pp. 201.
7. Johnson KE, Rodgers S. When cultural practices are health risks: the dilemma of female circumcision. *Holistic nursing practice*, 1994, 8:70-78.
8. WHO publication. An Overview of FGC. <http://apps.who.int> Assessed April 2012.
9. Womens' health publications fact sheet, a project of the U.S Department of Health and Human Services Offices on Women's Health.www.womenshealth.gov. Assessed June,2012
10. Jane NC. Ian. Askew Jennifer Lilan An Assessment of the Alternative Rites Approach for Encouraging Abandonment of Female Genital Cutting in Kenya www.popcouncil.org. .Assessed April 2012.
11. Ellen Gruenbaum. Sexuality Issues in the Movement to Abolish Female Genital Cutting in Sudan. *Medical Anthropology Quarterly*, Vol. 20, Number 1, pp. 121–138, ISSN 0745-5194
12. Susan Elmusharaf, Nagla Elhadi, Lars Almroth. Reliability of self reported form of female genital CUTTING and WHO classification: cross sectional study. *BMJ*, doi:10.1136/bmj.38873.649074.55 (published 27 June 2006)
13. Araoye M.O sample size Determinants in Research Methodology with Statistics for health and social sciences Nathadex Publishers,2004 Ilorin,pg 118
14. Koso_-Thomas,O (1987) *The Circumcision of Women. A Strategy for Eradication* London:Dotesios Ltd:pg 57
15. Abdall R. Sisters in Affiliation Circumcision and infibulations of women in Africa,London Zed Press, 1982:Assessed April 2012
16. Hosken F.P (1993): the Hosken report Genital and Sexual Mutilation of females,4th revised edition,Lexington,Massachusets,Women International Network News
17. Sarkis. M.T (2003) Female Genital Cutting. An introduction. The FGC Education and Networking Project.<http://www.fgmnetwork.org/introhtml> Accessed April 30,2007
18. Rushwan.H (1994) Female Circumcision. A reproductive Health Problem. *Reproductive Health in Africa*,Baltimore,pg 178-180

Knowledge and Practices about HIV/AIDS among Injecting Drug Users of Dhaka City in Bangladesh

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Abstract

This study assessed the knowledge related to HIV/AIDS and preventive practices among Injecting Drug Users (IDUs) of Dhaka city in Bangladesh. Bangladesh is turning into one with concentrated epidemic due to the high HIV prevalence rate among IDUs (7%). IDUs are vulnerable of acquiring HIV/AIDS due to their injecting practices and high risk behaviors. This is a descriptive cross-sectional study on 200 IDUs of Dhaka city was conducted to evaluate their knowledge.

About half of the respondents (48%) were in the age group of 18-26 years. Majority (58.5%) of the respondents had poor knowledge on HIV/AIDS. Regarding practice majority (94.5%) of the IDUs shared needle, 69% had multiple sex partners, out of which only 2.5% used new disposable syringe and only 4.8% always used condom during intercourse. Socio-demographic characteristics such as age and education of the respondents were significantly associated with knowledge on HIV/AIDS among IDUs ($p < 0.05$).

This study shows that knowledge alone is not enough to prevent HIV/AIDS but strategies to instill positive attitude and better practices for preventing HIV/AIDS transmission should be implemented.

Keywords: Knowledge, practice, HIV/AIDS, Intravenous drug users, Bangladesh

Introduction

The world has been fighting the relentless march of HIV/AIDS for the past two decades. According to UNAIDS 2013 approximately 35 million people worldwide were living with HIV/AIDS. A total of 6.4 million people belonged to the Asian region.¹ AIDS is increasingly becoming a major public health concern in many developing countries. A person with AIDS in a developing country may not survive for more than 2 years due to nutritional and immune status.¹

Bangladesh has a low HIV/AIDS prevalence rate of less than 0.1% but it is considered to be a high risk country.² This threat is significant for Bangladesh, considering the factors like geographic location which encourages population migration across high HIV prevalence neighboring countries, large number of population with STIs (Sexually Transmitted Infections), increasing number of IDUs and their risky behaviors, poverty, social stigma, gender inequity and above all, lack of proper knowledge about safe sex among the people.³ IDUs are also called bridging population as they contribute to the spread of HIV infection by needle sharing among themselves and spread to others by sexual contact and by selling infected blood. IDUs travel from one city to another which increases the risk of acquiring and spreading of infection. The Asian Epidemic Model shows that though the prevalence of HIV in Bangladesh remains relatively low, it is projected to give rise to an epidemic among general population through IDUs which otherwise could take decades to occur.⁴ Correct knowledge of HIV/AIDS among these vulnerable groups remains very low. Even when correct knowledge exists preventive behaviors are not being exercised.⁵

It is estimated that between 5 to 10 percent of HIV infections have resulted from injecting drug use globally.⁶ An estimated 13 million people inject drugs across the globe around 1.7 million of them are infected with HIV.⁷ The exact number of injecting drug users in Bangladesh is not known. It is apparent that the maximum number (20,000-40,000) of IDUs is in the capital city.⁸ HIV prevalence among IDUs of Dhaka city have shown an increase of 1.4% to 7% in past few years and in one locality this has now reached 10.5%.⁸ Many IDUs are not aware that they are at risk of contracting HIV. There is scarcity of data about IDUs' level of knowledge regarding HIV/AIDS in Bangladesh. The knowledge of IDUs on HIV infection or mode of transmission and its prevention is very limited. Therefore this study was designed to explore IDUs' knowledge about HIV/AIDS and their preventive practices.

Material and methods

Study Design:

This was a cross-sectional descriptive type of study to assess the knowledge regarding HIV/AIDS among IDUs and their preventive practices who were living in Dhaka city of Bangladesh with different socio-

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demographic background.

Subjects:

A total of 200 eligible consecutive respondents were selected through purposive sampling. The respondents were identified with the help of field supervisor of a drop-in center (DIC) working with IDUs at the study area. The rationale behind purposive sampling was an unwillingness of self-identification as IDUs due to social stigma.

Study Area:

The study area was selected purposively at Shahzadpur, Uttara, Dhaka.

Data Collection Method:

Data were collected using a semi-structured questionnaire which was adopted from the WHO Modified AIDS Questionnaire (WHO 1990) followed by face-to-face interview. The questionnaire includes socio-demographic information, knowledge regarding HIV/AIDS, and high risk behavior or practices related to HIV/AIDS transmission. Informed written consent was taken from each of the respondents prior to interview. The English questionnaire was translated into simple Bengali and after pre-testing the questionnaire was modified accordingly to assess its clarity, sequencing and time needed to complete.

Ethical aspects:

The Ethical Review Committee of Bangladesh University of Health Sciences (BUHS) approved the study. Written informed consent was obtained from all the participants. Ethics has been respected throughout the study period.

Scoring:

The questionnaire included 18 questions relating to awareness of HIV/AIDS with 54 probable answers. Each correct answer scored 1, and the wrong or unknown answer scored 0. The level of awareness was divided into two categories—poor and good. Poor knowledge referred to a score below 27; good knowledge was considered when respondents' score was above 27.⁹ Regarding practices 5 items questions were asked to the respondents and result was expressed in percentage.

Data Analysis:

Statistical analysis was done by using Statistical Package for Social Sciences (SPSS 17.0). Descriptive statistics were used for the interpretation of the findings. Frequency distribution for all the variables were worked out and produced in tabular form. The χ^2 test was used to examine the association of knowledge of the respondents with their socio-demographic characteristics. A two-tailed p value of

<0.05 was considered significant at 95% CI (Confidence Interval) level.

Results

About half of the respondents (48%) were in the age group of 18-26 years, majority (67.5%) were married and 33% were educated up to secondary level and 28% were illiterate. 43% of the IDUs live in rented house and their average monthly income was between 4500-6500 [Table 1].

The bar chart in Figure 1 shows that average 62.9% respondents gave correct answer, 31.9% gave incorrect answer based on 200 responses against each knowledge item question (18 items) on HIV/AIDS [Table 2]. After following the scoring method

Table-1: Socio-demographic Characteristics of the respondents (n=200)

Characteristic	Number	%
Age in years		
18-26	96	48
27-35	67	33.5
36-44	19	9.5
45-53+	18	9
Marital status		
Married	135	67.5
Unmarried	58	29
Divorced	7	3.5
Education of respondents		
Illiterate	55	27.5
Only reading	21	10.5
Reading and writing	58	29
Fifth grade to tenth grade	66	33
Education of father		
Illiterate	112	56
Only reading	11	5.5
Reading and writing	64	32
Fifth grade to tenth grade	13	6.5
Occupation of father		
Farmer	70	35
Unemployed	24	12
Shopkeeper	64	32
Others (Labors, Boat man, Rikshaw puller)	42	21
Place of residence		
Living with family	120	60
Living with others (mess, rickshaw garage)	80	40
Monthly family income		
4500-5500	93	46.5
5501-6500	82	41
6500+	25	12.5

Results are expressed as number (percentage)

Table -2: Respondent's knowledge about HIV/AIDS (n=200)

*Knowledge item	Correct		Incorrect		Don't Know	
	No	%	No	%	No	%
Conception about HIV/AIDS	82	41	100	50	18	9
Causative agent of AIDS	98	49	88	44	14	7
AIDS is an infectious disease	111	55.5	77	38.50	12	6
Mode of Transmission of HIV/AIDS	69	34.5	75	37.50	56	28
AIDS is not a serious disease. It is a simple disease like the common cold	105	52.5	49	24.50	46	23
Mosquito bite and HIV Transmission	81	40.5	73	36.50	46	23
Bathing, sharing bed and cloth and HIV transmission	46	23	114	57	40	20
Treatment of AIDS	136	68	16	8	48	24
Vaccine of AIDS	114	57	33	16.5	53	26.5
Risk factors of HIV/AIDS	86	43	96	48	18	9
Consequences of HIV/AIDS	79	39.5	102	51	19	25.5
High risk groups of HIV/AIDS transmission	90	45	63	31.50	47	23.5
Conception about contraceptive method to prevent HIV/AIDS	79	39.5	46	23	67	33.5
Service available for health education about HIV/AIDS	85	42.5	16	8	99	49.50
Morality due to HIV/AIDS	90	45	48	24	62	31
Prevention of AIDS	94	47	77	38.50	29	14.50
Screening test for HIV	122	61	22	11	56	28
Available source of information on HIV/AIDS	77	38.5	53	26.50	70	35

*Results are expressed as number (percentage). *Multiple responses.*

described above it was found that more than half of the respondents (58.5%) had poor knowledge and 41.5% had good knowledge on HIV/AIDS (on the basis of age and education of the respondents) [Table 4].

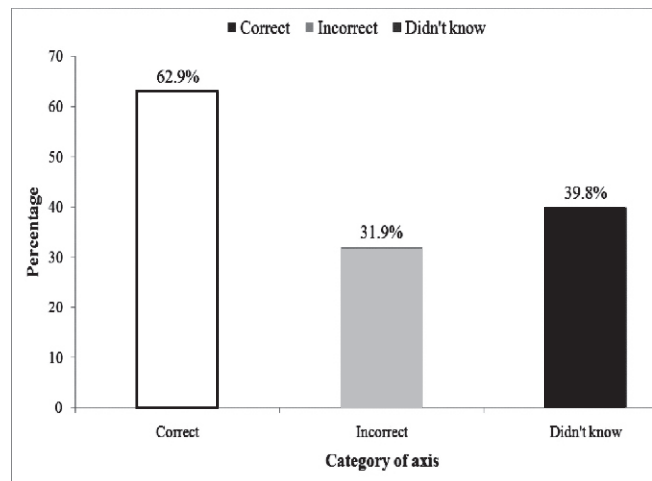
More than half (55.5%) of the IDUs had knowledge that AIDS is an infectious disease, 49% had correct knowledge about causative agent of AIDS, whereas 28% had no idea about mode of transmission of HIV/AIDS and 37.5% had incorrect knowledge on it. Only 43% and 39.5% had correct knowledge on risk factors and consequences of HIV/AIDS respectively. About 23.5% IDUs didn't know about the high risk group of HIV/AIDS and one-third of them had no knowledge on prevention of HIV/AIDS through contraception. Less than half (42.5%) of the respondents were informed about available services on HIV/AIDS and 31% of them had incorrect knowledge regarding mortality due to HIV/AIDS. Of the

respondents, 68% had knowledge on treatment, 47% knew the preventative measures of HIV/AIDS and a good percentage (61%) had knowledge on screening test for HIV. On the other hand about 36.5% of IDUs had misconception that mosquito bite causes HIV and 57% had misconception on HIV transmission by bathing, sharing bed & cloths. Only 38.5% were aware of the available source of information on HIV/AIDS [Table 2]. More than half (57%) of the respondent IDUs had correct knowledge that there is no vaccine available for HIV/AIDS. Regarding practice, majority (94.5%) of the IDUs shared needle. Only 2.5% used new disposable syringe. More than two third (69%) respondents had multiple sex partners but only 4% always used condom during intercourse [Table 3]. Socio-demographic characteristics such as age and education of the respondents and level of education of father were significantly associated with knowledge on

Table- 3: Respondent's practice towards HIV/AIDS prevention (n=200)

Practice item	Number	%
Needle sharing		
Yes	189	94.5
No	11	5.5
Use of disposable new syringe		
Yes	5	2.5
No	195	97.5
Multiple sex partner		
Yes	138	69
No	62	31
Condom use during intercourse		
Sometimes	96	48
Always	8	4
Never	96	48
Behavioral information		
Smoking	137	68.5
Alcohol	13	6.5
Others (Betel leaf and Nut)	50	25

Results are expressed as number (percentage)

Figure - 1: Percentage of IDUs stating correct/incorrect answer on 18 knowledge item question**Table -4: Association between respondent's knowledge and socio-demographic characteristics (n=200)**

Variables	Knowledge		p value
	Good Knowledge	Poor Knowledge	
	Number (%)	Number (%)	
Age in years			
18-26	44 (22)	52 (26)	0.022
27-35	25 (12.5)	42 (21)	
36-44	7 (3.5)	12 (6)	
45-53+	7 (3.5)	11 (5.5)	
Education of respondents			
Illiterate	14 (7)	41 (20.5)	0.006
Only reading	6 (3)	15 (7.5)	
Reading & writing	24 (12)	34 (17)	
Class V to SSC	39 (19.5)	27 (13.5)	
Education of father			
Illiterate	40 (20)	72 (36)	0.009
Only reading	6 (3)	5 (2.5)	
Reading & writing	28 (14)	36 (18)	
Class V to SSC	9 (4.5)	4 (2)	
Occupation of father			
Farmer	27 (13.5)	43 (21.5)	0.187
Shopkeeper	14 (7)	10 (5)	
Unemployed	25 (12.5)	39 (19.5)	
Others (Labors, Boat man, Rikshaw puller)	22 (11)	20 (10)	
Monthly family income			
4500-5500	38 (19)	55 (27.5)	0.085
5501-6500	42 (21)	40 (20)	
6500+	10 (5)	15 (7.5)	

Results are expressed as number (percentage). χ^2 -test was used. *The level of significance at $\alpha=0.05$

HIV/AIDS among IDUs ($p<0.05$). IDUs of 18-25 age groups had better knowledge on HIV/AIDS than other age groups. IDUs who were more educated (fifth grade to tenth grade) had higher knowledge on HIV/AIDS. But place of residence and monthly family income had no significant association with the level of knowledge

[Table 4].

Discussion:

The prevention of HIV infection remains an important task for public health professionals. Understanding the dynamics of HIV infection within a

country, how it changes over time and who is currently at greatest risk is essential for guiding decisions about effective prevention programs.¹⁰ Based on HIV/AIDS distribution models in human society, many epidemiologists believe that prevention of high-risk behaviors, including unsafe sexual activities and intravenous drug use are critical for the reduction of AIDS-associated morbidity and mortality.^{11,12} HIV infection in Bangladesh is concentrated primarily among intravenous drug users, suggesting an urgent need for prevention approaches targeted to this group.

In our study 18-26 years age group constituted approximately half of the respondents (48%). A study conducted in India showed that the majority of IDUs were in the age group of 18-24 years.¹³ Similar findings were reported from Myanmar where highest percentage of respondents (48.7%) belonged to the age group of 21-30 years.¹⁴ Exploring sexual interest is a common trait in young people of this age group. This exposes them to a higher risk-taking behavior including substance abuse.¹⁵ 67.5% of IDUs were married and only 33% were educated up to secondary level. In a study in Nairobi, Kenya most of the IDUs were found to be married.¹⁶ The level of secondary education is far below than that of Islamic Republic of Iran where 91.2% of IDUs had received secondary education.¹⁷

Response to the 18 knowledge item questions was similar to the result found in the study conducted among students in Yemen. It showed correct response in knowledge section was 67.6%, while 32.4% were incorrect or did not know the answer.¹⁸ This result is similar to studies conducted among students in Pakistan,¹⁹ India,²⁰ and Iran²¹ and among the general population in Bandar-Abbas city, Islamic Republic of Iran.²² It is also similar to other studies in China which were performed among university students.^{23,24}

This study showed there is difference in level of knowledge (i.e. good or poor) among study population on HIV/AIDS. In an Ethiopian study among adults living in the streets it was found that 31.4% had comprehensive knowledge about HIV/AIDS.²⁵ Intervention programs that are currently in place in Bangladesh may have resulted in better knowledge dissemination and lower rate of HIV prevalence than Ethiopia. It is evident from Table 2 that respondents' idea on multiple aspects of HIV/AIDS varied considerably. A study conducted in Iran revealed over 30% of respondents thought that AIDS was not a contagious disease among IDUs and the great majority (81.6%) knew that AIDS was caused by a virus.¹⁷ In another study among the students of a health institute of Sana in Yemen 85.3% of students knew AIDS is a communicable disease and 88.6% knew that HIV is the causative agent of AIDS.¹⁸

Correct knowledge on risk factors and consequences of HIV/AIDS are important in

preventing disease transmission. Availability of screening and treatment facilities for HIV are vital for high-risk groups like IDUs. This study revealed that 14.5% of IDUs did not know about the preventive measures of HIV/AIDS. This is similar to the findings in a Bangladeshi study investigating adolescent's knowledge about sexually transmitted diseases including HIV/AIDS (16.8% of adolescents).²⁶ Misconception on HIV transmission for example by bathing, sharing bed, cloths and mosquito bite is common.²³ Similar to the findings in our results, a study in China revealed about 41.4% respondents thought that HIV virus can be transmitted through the bite of a mosquito and 52.5% had a perception that by using an infected person's belongings, such as clothes, combs, underwear and towels (35.9%) can spread HIV.^{23,24}

Only 38.5% were aware of the available source of information on HIV/AIDS [Table 2]. Factors influencing needle-sharing include lack of information about unsafe injecting practices, cost, fear of law-enforcing agencies while procuring new equipment, socially accepted sharing practice and social stigma among others.³ We found that majority (94.5%) of the IDUs shared needle out of which only 2.5% used new disposable syringe. Behavioral study in Dhaka, Bangladesh showed as high as 86% of IDUs shared needles among themselves.²⁷ Lower degree of needle sharing (65%) was observed in Montenegro, Serbia in 2013.²⁸ Projection model shows that intervention program including needle exchange can dramatically reduce HIV prevalence among IDUs from 42% to 10.4% over a period of 8 years.²⁹ This highlights the importance of implementing demand-driven harm reduction strategies for IDUs.

High-risk behavior such as having multiple sex partners provides an opportunity for spreading HIV. The present study revealed 69% of IDUs had multiple sex partners, and only 4.8% always used condom during intercourse. A recent study showed only about 16% IDUs used condoms during intercourse.²⁷ It was found in another study around 87% of IDUs had multiple sex partners.³⁰ About 10% reported having unprotected sex (sex without condom); 6.0% had more than 1 sexual partner; 3.3% reported having sex with sex workers; and 4.5% reported having sex under the influence of alcohol evidenced in a study of China among university students.²⁴ The association between socio-demographic characteristics and knowledge is shown in table 4. Age and education of the respondents were significantly associated with knowledge on HIV/AIDS among IDUs ($p < 0.05$). IDUs of 18-25 years age groups had better knowledge on HIV/AIDS than other age groups. Poor awareness in the latter groups may be related to the traditional social system and healthcare service which often pay less attention to this group of people. Another study in Bangladesh reported similar findings.³¹

Literacy has a positive impact on improving awareness.³¹ It affected the level of awareness of HIV/AIDS in our study as well as other studies done elsewhere.³¹ This can be explained by the fact that educated people can acquire more knowledge when they are exposed to sources of available information like electronic media (databases, Internet) and printed materials (books, journals, newspapers, posters, booklets). Interestingly the education level of the respondents' father was also found to be significant. We hypothesize that a family willing to educate its children stand a better chance to educate themselves on HIV/AIDS. The highest number of the respondents was from low socio-economic background. However, their family income and occupation revealed no significant relationship with their awareness level.

Conclusions:

The IDUs are more vulnerable to the spread of HIV/AIDS through their high-risk behavior. Factors like age and education play an important role in raising awareness about HIV as evident in this study. The gaps that were found between knowledge and preventive practices among IDUs in this study calls for awareness of public health professionals and politicians. It is expected to encourage the policy makers to invest greater resources and attention in HIV prevention in future.

Conflict of Interest

None declared.

References:

1. UNAIDS (2012) Global Report: UNAIDS Report on the Global AIDS Epidemic 2013 Available at http://www.unaids.org/sites/default/files/media_asset/UNAIDS_Global_Report_2013_en_1.pdf Accessed on 8th March 2016
2. UNICEF (2009) Bangladesh statistics. Available at http://www.unicef.org/infobycountry/bangladesh_statistics.html Accessed on 8th March 2016
3. WHO (2010). Report on people who inject drugs in the South-East Asia Region. Available at http://www.who.int/hiv/pub/idu/people_who_inject_drugs_searo_010.pdf Accessed on 8th March 2016
4. Saidel TJ, Des Jarlais D, Peerapatanapokin W, et al. Potential impact of HIV among IDUs on heterosexual transmission in Asian settings: scenarios from the Asian Epidemic Model. *Int J Drug Policy* 2003; 14:63–74.
5. Bertoni N, Singer S, Silva CMFP, et al. Knowledge of AIDS and HIV transmission among drug users in Rio de Janeiro, Brazil. *Harm Reduct J* 2011;8:5
6. Mathers BM, Degenhardt L, Phillips B, et al. Global epidemiology of injecting drug use and HIV among people who inject drugs: a systematic review. *Lancet*

2008;372:1733–1745

7. WHO. People who inject drugs. Available from <http://www.who.int/hiv/topics/idu/en/> Accessed on 22nd March 2017
8. UNODC (2009). Bangladesh Country Advocacy Brief Injecting Drug Use and HIV. http://www.aidsdatahub.org/sites/default/files/documents/Bangladesh_Country_Advocacy_Brief_IDU_and_HIV_2009.pdf.pdf Accessed on 22nd March 2017
9. Hasan, AH, Hassan R, Khan ZR, et al. Influence of socio-demographic factors on awareness of HIV/AIDS among Bangladeshi garment workers. *SpringerPlus* 2013;2:174.
10. UNODC (2012). HIV prevention among young injecting drug users global youth network. Available from: www.unodc.org/pdf/youthnet/handbook_hiv_english.pdf Accessed on 23rd December 2015
11. Pisani E, Garnett GP, Grassly NC, et al. Back to basics in HIV prevention: focus on exposure. *British Medical Journal* 2003;326:1384–7.
12. Miller JE, Guarnaccia PJ, Fasina A. AIDS knowledge among Latinos: the roles of language, culture, and socioeconomic status. *J Immigr Health* 2002;4:63–72.
13. Armstrong G, Humtsoe C, Kermode M. HIV risk behaviours among injecting drug users in Northeast India following scale-up of a targeted HIV prevention programme. *BMC Public Health* 2011;11:S9.
14. Saw YM, Yasuoka J, Saw TN, et al. What are the factors associated with HIV testing among male injecting and non-injecting drug users in Lashio, Myanmar: a cross-sectional study. *BMJ Open* 2013;3:e002747.
15. Khan MA. Knowledge on AIDS among female adolescents in Bangladesh: evidence from the Bangladesh demographic and health survey data. *J Health Popul Nutr.* 2002;20:130-7.
16. Tun W, Sheehy M, Broz D, et al. HIV and STI prevalence and injection behaviors among people who inject drugs in Nairobi: results from a 2011 bio-behavioral study using respondent-driven sampling. *AIDS Behav.* 2015;19:24-35.
17. Majdi MR, Khani H, Azadmarzabadi E, et al. Knowledge, attitudes and practices towards HIV/AIDS among Iranian prisoners in Mazandaran province in the south-coast area of the Caspian Sea. *East Mediterr Health J.* 2011;17:904-10.
18. Al-Rabeei NA, Dallak AM, Al-Awadi FG. Knowledge, attitude and beliefs towards HIV/AIDS among students of health institutes in Sana'a city. *East Mediterr Health J.* 2012;18:221-6.
19. Khan H, Ishaq M, Khan H, Ishaq T. Knowledge and attitude of students regarding HIV/AIDS in Peshawar University. *RMJ* 2008;33:9.
20. Das BR, Sarkar AH, Nath G, et al. Knowledge, attitude and practices regarding HIV/AIDS amongst

- the adolescents- a hospital based study. *IJHSR* 2016; 6: 1-7.
21. Tavoosi A, Zaferani A, Enzevaei A, et al. Knowledge and attitude towards HIV/AIDS among Iranian students. *BMC Public Health* 2004;4:17.
22. Leili S, Elham S, Farkhondeh S. A population-based survey of HIV/AIDS knowledge and attitudes in general public, Bandar-Abbas, Iran. *Pak J Med Sci* 2008;24:838-44.
23. Ailan L, Liming L. A survey on STDs/AIDS knowledge, perception and sexual behavior among university students in Beijing. *J Pub. Health of China*. 1999;15:545-6.
24. Maimaiti N, Shamsuddin K, Abdurahim A, Tohti N, et al. Knowledge, attitude and practice regarding HIV/AIDS among university students in Xinjiang. *Global Journal of Health Science* 2010;2:51-60.
25. Megabiaw B, Awoke T. Comprehensive knowledge, attitude and practice of street adults towards human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) in Northwest Ethiopia. *Journal of AIDS and HIV Research* 2013;5:181-7.
26. Rahman MM, Kabir M, Shahidullah M. Adolescent knowledge and awareness about AIDS/HIV and factors affecting them in Bangladesh. *J Ayub Med Coll Abbottabad* 2009;21:3-6.
27. Islam SMS, Biswas T, Bhuiyan FA, et al. Injecting drug users and their health seeking behavior: a cross-sectional study in Dhaka, Bangladesh. *Journal of Addiction* 2015 doi:10.1155/2015/756579.
28. Lausevic D, Begic S, Mugosa B, et al. Prevalence of HIV and other infections and correlates of needle and syringe sharing among people who inject drugs in Podgorica, Montenegro: a respondent-driven sampling survey. *Harm Reduct J*. 2015;12:2.
29. Des Jarlais DC, Feelemyer JP, Modi SN, Abdul-Quader A, et al. High coverage needle/syringe programs for people who inject drugs in low and middle income countries: a systematic review. *BMC Public Health*. 2013;13:53.
30. Islam SKN, Hossain KJ, Kamal M, Ahsan M. Prevalence of HIV infection in the drug addicts of Bangladesh: drug habit, sexual practice and lifestyle. *Int J STD AIDS* 2003;14:762-4.
31. Mondal NI, Hossain M, Rahman M. Knowledge and awareness about HIV/AIDS among garments workers in Gazipur District. *The Social Sciences*. 2008;3:528-30.

Prevalence of Work-related Health Problems Among Providers of Car Battery Repair in a Resource-limited Setting

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Abstract

With urbanization, there is increasing use of automobiles, automobile batteries and consequently, there are an increasing number of lead acid battery repairers in the major cities of developing countries. This study assessed the prevalence of work-related health problems among lead-acid battery repairers in Ilorin, Nigeria.

This cross-sectional study recruited full time Lead acid battery repairers using a multistage sampling technique. Pre-tested interviewers administered questionnaire was used to collect data. Haematocrit was done for the consenting respondents.

A total of 200 car battery repairers agreed to be interviewed while 185 of them consented to sample collection, giving 100% and 93% response rate respectively. The leading reported health related health problem reported in the past six months was cut injury (65.5%) followed by electric shock (39.0%). Only a few reported weakness of grip (14.5%) anaemia (3.5%). The respondents with long years of work experience, (17-32 years), were about 8.7 times more likely to have low PCV compared with the others 17-32 years (P-value < 0.0001).

There is a high prevalence of work-related health problem among car battery repairers. There should be enlightenment of these workers on the hazards of the work. Also, used car battery collection and recycling program should be initiated and the use of personal protective devices and safety measures should be promoted.

Key words: Prevalence, work-related, battery chargers, occupational health, Nigeria.

Introduction

Lead acid battery maintenance and repair is done by battery repairers in their small scale battery repair

workshops. The process of lead acid battery repair involves dilution of concentrated sulfuric acid, replacement of electrolyte in the battery, re-charging of the battery using a rectifier connected to the main electricity supply. Lead (Pb) is the most abundant heavy metal and it is present in micro-quantity in common foodstuffs and human tissue, such as bone and blood. Lead has been identified as an important occupational hazard since the year 1896. Ever since then, Lead has remained the biggest cause of poisoning in industries, especially in developing countries.

With the urbanization, there is increasing use of automobiles, automobile batteries and consequently, there is increasing number of lead acid battery repairer in the major cities of developing countries. Lead acid battery repairers are exposed to varieties of occupational hazards ranging from the cumulative lead poisoning, acid splash, and electrical shock.

Lead is an important component of the Automobile Lead-Acid Battery (ALAB) in the form of electrodes and plates. Other components of the lead-acid battery are Sulfuric acid (H₂SO₄), distilled water and plastic casing. The process of battery re-charging leads to the production of heat; hydrogen gas; oxygen gas; and lead dust and fume.

Lead acid battery is the most important source of occupational lead poisoning, especially in the developing countries. The most important route of entry of lead is through inhalation of lead fume and dust. Ingestion of lead particles is another important route for particles greater than 10 micrometers in diameter.

The Centres for Disease Control (CDC) defined blood lead levels ≥ 10 micrograms per decilitre ($\mu\text{g/dl}$) of blood as toxic. Lead poisoning can affect varieties of organs and systems in the human body which includes central nervous system, peripheral nervous system, kidneys, gonads, endocrine system and most importantly the haemopoietic system. However, most people with lead poisoning do not feel sick or poisoned. In spite of the healthy feeling, high lead levels may still seriously affect health. The longer the high levels exist in the blood, the greater the risk of health problems and the damage may be irreversible. Severe cases of lead poisoning may result in delirium, convulsions, paralysis, coma, and death.

Lead poisoning is treated by preventing the worker from further exposure to lead and

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administration of chelating agents such as Ethylene-Diamine-Tetra-acetic Acid (EDTA). However, lead poisoning is preventable through workers' awareness of the hazards, the use of personal protective devices, safety measures. The aim of study was to assess the prevalence of work-related health problems among car battery (lead-acid) repairers in Ilorin, Nigeria.

Materials and Methods

Study design, settings and population

This cross-sectional study was carried out among battery repairers in Ilorin, Capital of Kwara State, Nigeria. Full time Lead acid battery repairer registered with the association of battery chargers and practicing their trade within Ilorin were included in this study. The apprentices were excluded. The sample size was determined using hypothesis testing method and based on the following assumptions; 95% confidence level, 7% of battery chargers with lead poisoning as a measure work-related health problem from previous study and a 5% margin of error giving a total of 100 participants required. The sample size was increased to 200 to cover possible non-response and improve the power of the study. Systematic sampling technique was used to recruit participants into the study using their association membership register as the sampling frame. Informed consent was obtained from the participants. Pre-tested interviewers administered questionnaire was used to elicit responses on socio-demographic characteristics, occupational history and work-related health problem.

Data Collection and Laboratory Analysis

Blood samples were collected from the participant after obtaining informed consent from them. The blood samples were collected by medical doctors at designated dust free locations outside the workshop of the battery repairers to avoid contamination. The site of the venopuncture was cleaned with soap and water, dried and then cleaned with spirit swab. The bottles were rolled gently after addition of the blood to allow proper mixing with the anticoagulant and prevent coagulation of the blood. Venous whole blood was collected using 5 milliliters Lead-free syringes to collect blood samples into EDTA, lead-free, vacuum, blood collection tubes. Four and half milliliters of whole blood was added into labeled EDTA bottles for haematological analysis. The bottles were then transported in ice boxes to the laboratory. All medical waste generated were incinerated. Packed Cell Volume (PCV) was done using capillary tubes, plastocael, haematocrit centrifuge and haematocrit reader.

Statistical Analysis

The data collected were cleaned before entered into computer and analyzed using SPSS version 16.

Quantitative variables were summarized using mean, range and standard deviation. Categorical variables were presented as frequencies and percentages. Chi-square and Fischer's exact probability were used to test the association between categorical variables. P value ≤ 0.05 was considered significant at 95% confidence level. The paper is reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.

Ethical Considerations

Informed consent was obtained from each participant before administration of questionnaire and collection of blood samples. The privacy of the study participants was maintained by interviewing them separately.

Results

A total of 200 battery repairers agreed to be interviewed while 185 of them consented to sample collection, giving 100% and 93% response rate respectively. Table 1 shows the summary characteristics of the study participants. As expected, all the participants were male with a mean age 36.6 (± 7.5 standard deviation). Almost all of the participants were married (92.0%) and most had secondary education (77.0%), while none had tertiary education. All the workers studied were of Yoruba ethnic origin (100%). The predominant religion of the workers is Islam (80.5%). The mean duration of work experience

Table 1: Socio-demographic Variables (N=200)

Socio-demographic Variables		Frequency	%
Age group (Years)	20-29	39	19.5
	30-39	70	35.0
	40-49	83	41.5
	50-59	8	4.0
	Mean(s.d.)	36.6(7.5)	
Marital status	Married	184	92.0
	Single	16	8.0
Highest Educational Qualification	Primary	46	23.0
	Secondary	154	77.0
Religion	Christianity	39	19.5
	Islam	161	80.5
Duration of Work Experience (Years)	1-5	38	19.0
	6-10	16	8.0
	11-15	41	20.5
	16-20	82	41.0
	21-25	16	8.0
	26-30	0	0.0
	31-35	7	3.5
	Mean (s.d.)	14.7(7.2)	

Table 2: Distribution of Respondents by Types of Battery Work (N=200)

Type of Battery Work	Frequency	%
Recharging Battery	200	100.0
Rebuilding Battery	168	84.0
Storing Battery	150	75.0
Melting battery	145	72.5
Breaking Battery	144	72.0
Others	55	27.5

Table 3: Influence of education on selected self-reported work related ailments

Highest Educational Qualification	Self-Reported Anaemia		Reported Abdominal Pain	
	Yes	No	Yes	No
Primary	7 (3.5)	39 (19.5)	23 (11.5)	23 (11.5)
Secondary	0(0.0)	154 (77.0)	30 (15.0)	124 (62.0)
TOTAL	7(3.5)	193(96.5)	53 (26.5)	147 (73.5)
	Fisher's exact P?0.0001		X ² = 16.9383 P ?0.0001	

Table 4: Distribution of Respondents' PCV by years of work experience (n=185)

Years of experience	Packed Cell Volume n(%)		Total
	Low 35-39%	Normal 40-44%	
1-16 years	6(3.2)	93(50.3)	99 (53.5)
17-32 years	31(16.8)	55(29.7)	86(46.5)
Total	37(20.0)	148(80.0)	185(100.0)

X² = 25.863; P-value = 0.000 OR 0.114 (8.736)

(±standard deviation) was 14.7(7.2) years. The least duration of work experience as battery repairer was 1 year, while the longest duration was 32 years. The 16-20 year period accounted for the highest proportion of the respondents, 82 (41.0%).

Table 2 shows that all the respondents engaged in the process of Lead Acid Battery recharging. Also, the majority of the respondents was involved in the process of rebuilding Lead Acid Batteries 168 (84.0%) while 150, 3 out of 4 of the participants' store used battery in their workshop.

The leading reported health related health problem suffered in the past six months before the study was cut injury (65.5%) followed by electric shock (39.0%). Only a few reported weakness of grip (14.5%) and anaemia 7 (3.5%) as shown in Figure 1.

Table 3 shows that more of the respondents with secondary education do not report anaemia 154 (77.0%) and abdominal pain 124(62.0%) compared with the respondents with primary education. The differences were statistically significant with p values ?0.0001 respectively.

Table 4 shows that more of the respondents with 17-32 years' work duration had low PCV 31, (16.8%) compared with respondents with 1-16 years' work experience. Therefore, there is statistically

significant association between the years of work experience and level of packed cell volume of the respondents (P-value <0.0001). The respondents with long years of work experience, (17-32 years), were about 8.7 times more likely to have low PCV compared with the others.

The relationship between PCV and duration of occupation is summarized in Figure 2. We observed an inverted U-shaped relationship, such that on average after seven years of occupation, the PCV started decreasing gradually, however, after 11 years the rate of decline in PCV becomes steeper.

Discussion

This study examined the prevalence of work-related health problems among lead-acid battery repairers in Ilorin, Nigeria. We found that the most commonly reported work-related health problem was cut (66%) followed by electric shock (39%) and acid burn (31%). The respondents' age ranged from 22 years to 52 years. The mean age was 36.5 years while the modal age was 34 years. This finding is similar to the finding of Ahmed et al who reported aged range between 23 and 57 years and who had worked for over six months in lead acid battery repair units of transport service enterprises in Addis Ababa. All the workers

studied were male. This is different from the finding of Ahmed et al where 11.1% of the respondents were female. The difference could be due to cultural differences. In Nigeria, women rarely engage in occupations requiring technical skills. However, the finding is similar to that of Sabitu et al among another group of artisan where all the respondents were male. Majority of the workers were married (92.0%) and were of the Islamic faith (80.5%). All the respondents were Yoruba. The majority of the respondents, 77.0% had secondary education and none of the workers had tertiary education. This is probably due to low educational requirement for the workers.

Many of the workers had worked for 16-20 years (41.0%). The mean duration of work experience was 15 years. All the respondents were engaged in the process of recharging Lead Acid Battery. This is the basic job task of the respondents. The process of charging battery exposes the workers to inhalation of lead fume especially in the confine of poorly ventilated workshop without negative ventilation equipments. Majority of the respondents (84.0%) were involved in the process of rebuilding Lead Acid Batteries as well as melting batteries (72.5%). These tasks lead to raw handling of inorganic lead metal components of batteries and leading to probable ingestion and inhalation of dust particles and eventual contamination of the workshop soil and surface water. This was demonstrated by a study in Jamaica, where the majority of workshop soil was contaminated by lead beyond tolerable limits. Storage of used Lead Acid Batteries 75.0% is a common practice among battery repairers that exposes the worker to high dosage and prolonged effects of lead poisoning as well as the environment to contamination with lead. This can be prevented by using lead battery collection and recycling program. Anyone in possession of the battery could be paid a token for collection the cost which could be built into the manufacturing and sale of new battery. The proliferation of maintenance free car batteries and dry cell batteries could lead to accumulation of used battery and hence, there is an urgent need for a collection program in Nigeria.

The workers reported work-related health problems suffered in the past six months. Nearly 2/3rd of the respondents (65.5%) suffered cut injuries at work while very few respondents reported anaemia (3.5%) diagnosed by health workers. More than a quarter of respondents (26.5%) reported abdominal pain while some of the respondents (14.5%) reported weakness of grip. These were slightly higher than the report of the Addis Ababa study where abdominal ache and weakness of joint accounted for 15.7% and 9.8%, respectively. The higher prevalence of work-related health problem may be a pointer to the fact that many workers may not take appropriate precautions in the prevention of injuries and work-related health

problems despite being aware of the hazards. However, lead poisoning often time, is asymptomatic while the exposed worker is suffering from the disease.

A common symptom of lead poisoning is anaemia. Packed Cell Volume (PCV) is an indicator of anemia. An adult male with hemoglobin <13 g/dl or PCV less than 39.0% is considered anemic. One out of five respondents (20.0%) had PCV in the range of 35-38% indicating anaemia among the respondents. This means that there is moderate anemia (20%-29%) among the population of the workers that warrants public health intervention. Similarly, there was a significant association between the respondents' level of education and self report of abdominal pain. Therefore, the less educated workers were more likely to report the work-related health problems which are pointing to lead poisoning.

The influence of years of working experience on Packed Cell Volume was examined. There was statistically significant association between the years of work exposure period to lead and level of packed cell volume of the respondents. The workers with long working experience (17-32 years) had lower Packed Cell Volume compared with the workers with shorter years of experience. This can be explained by the nature of lead toxicity which is cumulative over the years. The half-life of lead in the bone storage in adults is more than 25 years. Despite the cessation of further exposure, the bone store is a source of steady, slow release of lead back to the blood which continuously depresses red blood cell production.

Findings from this study have some research and policy implications. The cross-sectional nature of the study limits the ability casual inferences regarding the reported health-related complications. There is a need for a nationwide study to examine the detrimental health effect of the prolonged exposure of the car battery repairers to the hazards of their work and hence to directly assess the blood lead level of these workers in Nigeria as well as other systemic effects of lead on their health. In addition, policy makers may consider starting used car battery collection and recycling program.

The findings of this revealed that the most prevalent work-related health problem suffered by the Lead Acid Battery workers in Ilorin West Local Government Area of Kwara State was cut injuries followed by electrical shock then acid burns. In addition, we found that workers with long working experience (17-32 years) were about eight times more likely to have a lower Packed Cell Volume compared with the workers with shorter years of experience. The high prevalence of work-related health problem may be a pointer to the fact that many workers do not take appropriate precautions in the prevention of injuries and work-related health problems.

References

1. Kimani NG. Blood lead levels in kenya: A case study for children and adolescents in selected areas of nairobi and olkalou, nyandarua district. The United Nations Environment Programme (UNEP) [Internet]. 2005:[1-26 pp.].
2. Asogwa SE. Occupational diseases: The systemic effects of specific occupational disease agents. In: Asogwa SE, editor. A guide to occupational health practice in developing countries. 3rd ed. Enugu: Fourth Dimension Publishers; 2000. p. 132-39.
3. Park K. Occupational health. In: Park K, editor. Park's textbook of preventive and social medicine. 18th ed. India: M/s Banasidars Bhanot; 2005. p. 610-11.
4. Obionu CN. Organization of occupational health services. In: Obionu CN, editor. Synopsis of occupational diseases 1st ed : ; . Enugu: Delta Publication Nigeria Limited; 1999. p. 15-6.
5. Obionu CN. Occupational diseases caused by chemical hazards. In: Obionu CN, editor. Synopsis of occupational diseases 1st ed : ; . Enugu: Delta Publication Nigeria Limited; 1999. p. 40-2.
6. Safety & Health Assessment & Research for Prevention Program (SHARP). Occupational lead exposure: An alert for workers: Safety & Health Assessment & Research for Prevention (SHARP) Program; 1999.
7. World Health Organization (WHO). Lead In: World Health Organization (WHO), editor. Air Quality Guidelines. 2nd ed. Copenhagen: WHO Regional Office for Europe; 2001. p. 1-17.
8. Alessio L, Cortesi I, Materzanini P, Barenghi M. 100 years of lead poisoning studies from a reading of articles published in la medicina del lavoro. . Nov-dec; Med Lav. 1999;90(6):791-807.
9. Asogwa SE. Blood lead concentration in road-side battery chargers in nigeria. Arh Hig rada topksikol. 1979;30:157-62.
10. von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP, et al. The strengthening the reporting of observational studies in epidemiology (strobe) statement: Guidelines for reporting observational studies. Epidemiology. 2007;18(6):800-4.
11. Ahmed K, Ayana G, Engidawork E. Lead exposure study among workers in lead acid battery repair units of transport service enterprises, addis ababa, ethiopia: A cross-sectional study. J Occup Med Toxicol. 2008;3-30.
12. Sabitu K, Iliyasu Z, Dauda MM. Awareness of occupational hazards and utilization of safety measures among welders in kaduna metropolis, northern nigeria. Annals of African Medicine. 2009;8(1):46 - 51.
13. Park K. Nutrition and health. In: Park K, editor. Park's textbook of preventive and social medicine. 18th ed. Jabulpur: M/s Banasidars Bhanot; 2005. p. 450.
14. WHO. Worldwide prevalence of anaemia1993-2005 In: Benois B, McLean E, Egli I, Cogswell M, editors. WHO Global Database on Anaemia. Geneva: World Health Organization; 2008.

Haematological Effects Of Aqueous Extract Of *Vernonia Amygdalina* And A Known Immunostimulant In Wistar Rats

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Abstract

Plants have provided sources of drugs which have made contribution to health. The use of plant extracts for the treatment of diseases is being practiced widely. *Vernonia amygdalina* (VA), otherwise known as bitter leaf is a shrub that grows commonly in tropical Africa and consumed as vegetable. People have considered bitter leaf as a traditional medicine, as its being used for the treatment of various illnesses such as fever, diarrhea, malaria, etc. However, its haematological effects are to be explored in this study.

Thirty adult male wistar rats weighing averagely 150g were studied. They were housed, fed and cared under humane conditions in the animal house. They were divided into six groups of 5 each, with groups I and II being controls while the others were experimental. Prednisone was administered for two weeks, then blood samples were taken following which the treatments were given for specified periods. The animals were thereafter sacrificed and blood samples for CD4 and haematologic parameters taken, as well as splenic organ for histology.

The results show weight increase across all groups. There was no appreciable difference in the CD4 and red blood cell count in the bitter leaf groups while the levamisole had significant decrease in these parameters. Bitter leaf was associated with significant decrease in haemoglobin level. The photomicrographs of the spleen showed decrease dimension in the white pulp and marginal zone. Levamisole and *Vernonia amygdalina* were associated with decreased haematological parameters.

Keywords: *Vernonia amygdalina*, Levamisole, Haematological parameters, Wistar rats

Introduction

Plants have provided sources of novel drug compounds that have made large contribution to human health and wellbeing through their various

micronutrients contents. The use of plant extracts for the treatment of diseases is being practiced by many communities worldwide, usually discovered by trials and are being passed down to younger generations. *Vernonia amygdalina*, otherwise known as bitter leaf, is a shrub that can grow into a tree up to 3metres high in the African tropics and other parts of Africa, especially Nigeria, Cameroon, Zimbabwe where it is commonly consumed as a vegetable¹. It is called 'ewuro' by the Yoruba and 'onugbu' by the Igbo tribes.

Bitter leaf is commonly used in traditional medicine such as in the treatment of fever, malaria, diarrhoea, and as a fertility inducer. In the wild, Chimpanzees have been observed to ingest the leaves when suffering from parasitic infestations, while its use was shown to induce apoptosis, suppress metastatic cancerous cells and has antioxidant properties^{2,3}.

Levamisole is an anti-nematodal drug, that has broad range of activity. It is an immunostimulant, whose effect may be related to T-cell activation and proliferation⁴. Immunostimulants can be administered by varied routes, with orally being the common form of administering levamisole in this environment. Levamisole is said to enhance T-lymphocytes and macrophages of healthy and immunocompromised individuals⁴.

The spleen is composed of white and red pulp, separated by marginal zone. The red pulp functions in filtering antigens, microorganisms and worn out red blood cells and inclusions, while the white pulp forms lymphoid cells composed of T- and B-cells. The spleen is the largest secondary lymphoid organ. Due to the presence of B- and T-lymphocytes, the immunotoxic effects of substances or their metabolites may be reflected in the spleen. Therefore, it is an organ to evaluate for enhanced histopathology of the immune and haematology systems.

Vernonia amygdalina (VA) having known to have varied reports on its benefits with few studies having explored its immunological nor haematological effects, this study therefore aims at determining its effects on these systems by monitoring parameters such as CD4, erythrogram and leukogram of animals administered with the aqueous extract of VA in adult male wistar rats.

Materials And Methods

Preparation of leaf extract

Vernonia amygdalina leaves were obtained from the botanical garden of Department of Plant

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Biology, University of Ilorin. It was then identified by a botanist in their herbarium with voucher number UILH/001/302. The leaves were air dried for 10 days, then pulverized into a powder using a blender and then sieved. The powdered leaf was then defatted using N-hexane for 3 days, which then evaporated. The residue was subsequently soaked in distilled water for three days, then cold extraction was done. The extract obtained was concentrated using a rotary evaporator at 40 degrees centigrade. Twenty gram of the extract was dissolved in 200ml distilled water to make a 10% solution and 30g in 200ml to make 15% solution, which were used for the administration.

Animal care

Thirty adult male wistar rats weighing about 150g were purchased from Afolabi farm, Oke Olowo, Ilorin, Kwara State, were used for this experiment. The animals were housed in wooden cages that had wire protection as well as mosquito nets. They were allowed to acclimatize in the College of Health Sciences animal house for two weeks under normal atmospheric conditions before commencement of the study. They were fed with feed pellets bought from Ogo-Oluwa feeds, Sango, Ilorin. The feeds were in plates while water was in smaller bowls, and this was liberally available to them. The feeds and water were changed daily after cleaning the containers, and the cages were similarly cleaned twice daily. They were kept in 6 cages consisting of five rats each. The animals received humane care and were under standard laboratory conditions. They were all marked with different colours on their body, to aid identification of specific animal in each cage.

Animal grouping and treatment

The animals were randomly divided into six groups consisting of five rats each. The following treatments were administered according to the groups
Group I, control, 2ml distilled water daily (a vehicle)
Group II, 2mg/kg prednisone for 14 days
Group III, 2mg/kg/day prednisone for 14 days, then 250mg/kg/day of VA for 21 days
Group IV, 2mg/kg/day prednisone for 14 days, then 375mg/kg/day of VA for 21 days
Group V, 2mg/kg/day prednisone, then 250mg/kg/day of VA for 21 days + 50mg/kg levamisole for 7 days
Group VI, 2mg/kg/day prednisone for 14 days, then 50mg/kg levamisole for 7 days

Prednisone was administered to suppress immunity for fourteen days, while levamisole was used as a standard reference immune booster, whose effects is to be compared with the VA extract^{5,6}. The administration was done daily by 7a.m using a long flexible ball tip gastric gavage, that was attached to a 2ml syringe, which contained what to be administered.

Sample collection, animal sacrifice and tissue

processing

Retroorbital blood was obtained by inserting heparinized capillary tube into the angle of the eye of rats in groups III to VI after 14 days of prednisone administration, which was used for haematological analysis, and this was named post suppression result. Group II animals were sacrificed by euthanasia using ketamine after 24 hours of the last administration, from which blood samples were obtained.

The other groups had their treatments continued after the retroorbital blood was taken for the duration as outlined above. On completion of treatment, they were weighed, euthanized then dissected and blood taken via cardiac puncture into heparinized (EDTA) bottles. The spleens were removed, then observed for gross pathology. The spleens were immediately fixed in 10% buffered formalin for 48 hours then processed and embedded in paraffin wax⁷. Serial histological sections were made in line with Gray method then stained with Haematoxylin and Eosin according to Fischers method^{8,9}. The slides were then examined under light microscope.

Procedure for haematological parameters and CD4 count

Haemoglobin, red blood cell, white blood cell, platelets and lymphocyte counts were analyzed using the Sysmex automated haematology analyzer KX-21N, Sysmex Corporation, Kobe, Japan and the CD4 count used Partec Cyflow counter 1, Germany, 2017.

Light microscopy

The spleen sections on glass slides were viewed using Olympus binocular research microscope, connected to a 5.0MP Amscope camera (Amscope Inc, USA).

Statistical analysis

Results were expressed as mean $\pm$ SEM. Statistical analysis was performed by analysis of variance using Statistical Package for Social Sciences (SPSS) version 20.0. Students t-test at 95% level of significance was used

Results

Weight changes of the animals

The weights of the animals shown were those taken at the onset of the study and on the day of the sacrifice, as well as the weight differences. There was weight gain across all groups studied. The control animals had a significant weight increase, similarly with the low dose bitter leaf group.

CD4 and haemogram parameters

The CD4 count of the control group was 7.33 ± 1.20 . There was no significant difference in the control CD4 count compared with groups administered prednisone. There was no appreciable difference in the CD4 and

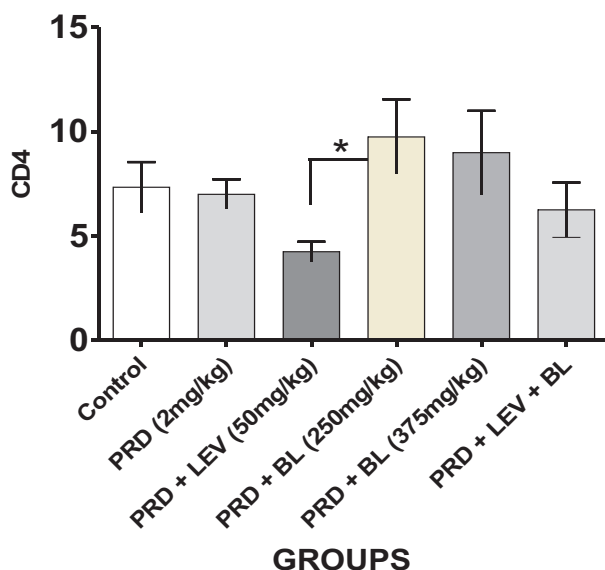


Figure 1: CD4 levels in animals exposed to prednisone followed by concurrent treatment with levamisole and increasing doses of bitter leaf extract. * $(P=0.05)$ statistical significant difference.

RBC counts of animals administered both low and high dose bitter leaf while there was a significant decrease in these parameters in the levamisole only group. The hemoglobin, white blood cell count and neutrophil levels were reduced in all groups studied. The platelet count was increased across all groups with the *Vernonia amygdalina* groups having much higher increases. Results obtained in the levamisole plus VA group were a combination of those administered isolatedly. The platelets count was increased in all groups with the VA groups having much higher increases.

Histological observation

The control group depicts the normal splenic histology, showing a central arteriole, periarteriolar lymphoid sheath (PALS), marginal zone and an adjacent red pulp. The low and high dose VA groups had decreased cellularity in both the PALS and marginal zone. In addition, the high dose group showed dilated blood vessels. The levamisole group was characterized by loss of architecture of the spleen as red and white pulps in many parts of the spleen as well

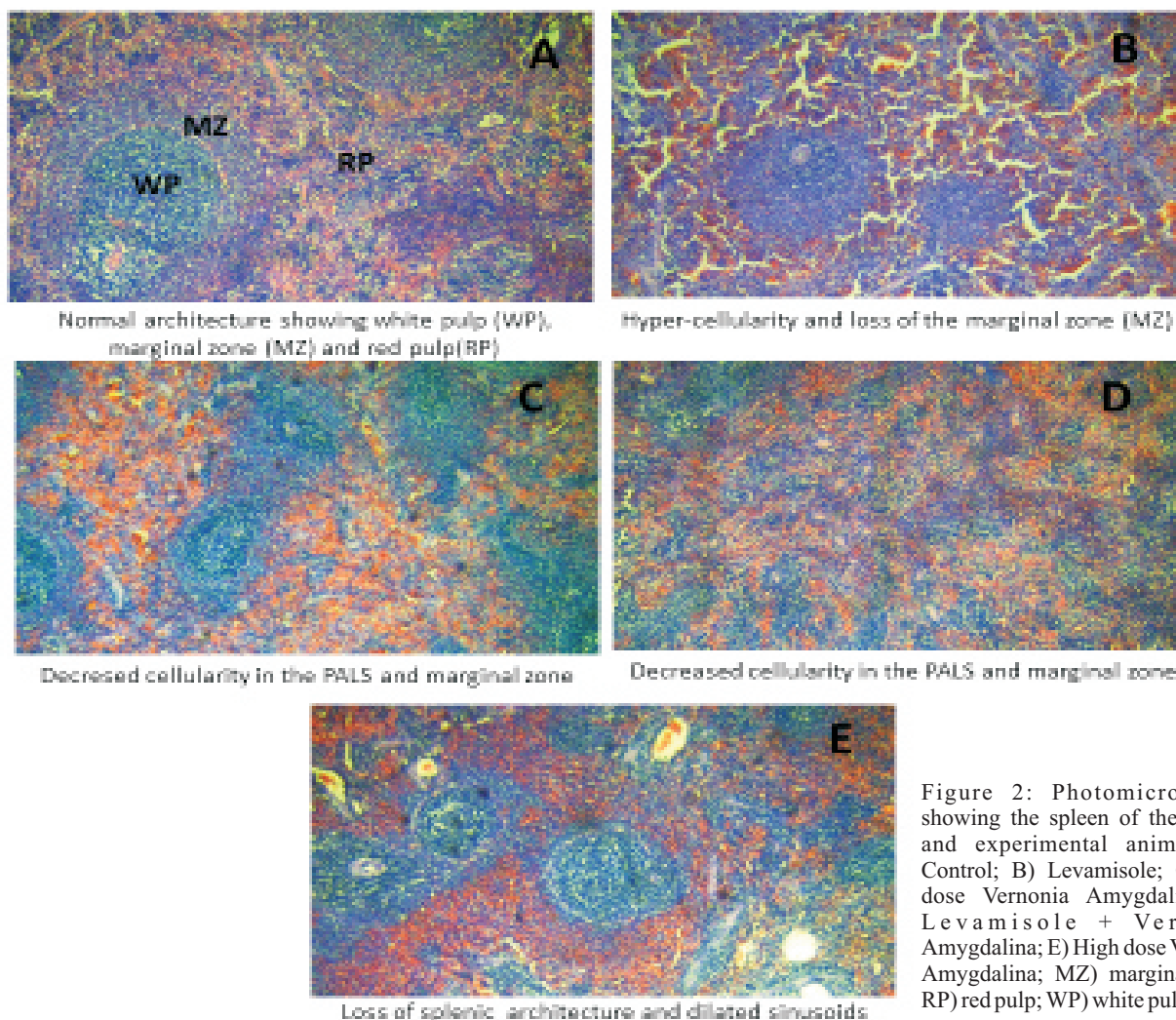


Figure 2: Photomicrographs showing the spleen of the control and experimental animals. A) Control; B) Levamisole; C) Low dose *Vernonia Amygdalina*; D) Levamisole + *Vernonia Amygdalina*; E) High dose *Vernonia Amygdalina*; MZ) marginal zone; RP) red pulp; WP) white pulp.

Table I: Body weights of experimental animals

Parameters	Initial weight (g)	Final weight (g)	Weight Diff.	P value (ANOVA)
Control	172.7±7.69	203.3±4.41	30.7±8.86	0.03*
PRD (2mg/kg)	162.5±5.56	180±4.55	17.5±7.18	0.05
PRD + LEV (50mg/kg)	165.5±1.89	179.3±2.29	13.8±2.97	0.004*
PRD + LBiL (250mg/kg)	165.5±3.86	195±9.57	29.5±10.3	0.03*
PRD + HBiL (375mg/kg)	163.6±4.67	179.6±6.79	16±8.24	0.09
PRD + LEV + LBiL	159.2±1.46	174±10.97	14.8±11.1	0.22

*(P=0.05) statistical significant difference compared to initial weight.

Table II: Effects of low dose bitter leaf extract (250 mg/kg) post-suppression(PS) and post-treatment (PT) on Haematological Parameters

Parameters	PS	PT	Diff	P value (ANOVA)
CD4	10.25±1.11	9.75±1.80	0.50±2.11	0.82
Haemoglobin	14.2±0.40	12.2±0.49	2.0±0.63	0.02*
Red blood count	8.38±0.23	8.33±0.42	0.06±1.24	0.91
Platelets	452±60.1	636±57.1	-184±82.8	0.07
White blood count	7.13±1.13	4.85±0.47	2.28±1.22	0.11
Lymphocyte count	4.5±0.87	4.2±0.39	0.33±0.95	0.74
Neutrophils	36.2±2.04	11.9±1.52	24.3±2.55	0.0001*

PS- post-suppression (after administration of 2 mg/kg prednisone), PT- post-treatment with low dose (250 mg/kg) Bitter leaf extract. Data represented as mean±SEM. *(P=0.05) statistical significant difference compared to post-suppression.

Table III: Effects of high dose bitter leaf extract (375 mg/kg) post-suppression and post-treatment on Haematological Parameters

Parameters	PS	PT	Diff	P value (ANOVA)
CD4	7.75±1.3	9.0±2.0	-1.25±2.24	0.61
Haemoglobin	14.1±0.37	11.5±0.7	2.58±0.70	0.02*
Red blood count	7.26±0.57	7.93±0.31	-0.68±0.87	0.48
Platelets	594±50.0	801±69.0	-207±86.0	0.07
White blood count	12.3±1.88	5.7±0.15	6.63±2.82	0.07
Lymphocyte count	8.0±1.37	4.15±0.55	3.85±2.1	0.14
Neutrophils	33.8±4.45	26.5±7.65	7.3±8.16	0.42

PS- post-suppression (after administration of 2 mg/kg prednisone), PT- post-treatment with high dose (375 mg/kg) Bitter leaf extract. Data represented as mean±SEM. *(P=0.05) statistical significant difference compared to post-suppression.

Table IV: Effects of levamisole (50 mg/kg) post-suppression and post-treatment on Haematological Parameters

Parameters	PS	PT	Diff	P value (ANOVA)
CD4	9.75±1.32	4.25±0.48	5.5±1.40	0.008*
Haemoglobin	15.1±0.55	13.0±0.57	1.7±0.79	0.07
Red blood count	8.66±0.26	7.6±0.28	1.04±0.38	0.03*
Platelets	585±75.9	621±92.1	-36.3±119.3	0.77
White blood count	8.85±1.78	6.75±0.58	2.1±1.88	0.31
Lymphocyte count	5.78±0.79	5.62±0.39	0.15±0.88	0.87
Neutrophils	31.2±7.08	14.8±3.31	16.4±7.81	0.08

PS- post-suppression (after administration of 2 mg/kg prednisone), PT- post-treatment with low dose (250 mg/kg) Bitter leaf extract. Data represented as mean ± SEM. *(P=0.05) statistical significant difference compared to post-suppression.

Table V: Effects of Levamisole 50 mg/kg and low dose bitter leaf extract (250 mg/kg) post-suppression and post-treatment on Haematological Parameters

Parameters	PS	PT	Diff	P value (ANOVA)
CD4	6.75±0.75	6.25±1.32	0.5±1.51	0.75
Haemoglobin	15.1±0.55	12.0±0.30	3.1±0.62	0.003*
Red blood count	8.58±0.22	7.5±0.33	1.07±0.40	0.03*
Platelets	643±193.9	770±74.1	-128±207.6	0.56
White blood count	7.33±1.22	5.53±0.96	1.8±1.56	0.29
Lymphocyte count	4.40±0.31	4.05±0.87	0.35±0.93	0.72
Neutrophils	35.6±6.14	25.4±7.92	11.2±10.02	0.31

PS- post-suppression (after administration of 2 mg/kg prednisone), PT- post-treatment with 50mg/kg levamisole and high dose (375 mg/kg) Bitter leaf extract. Data represented as mean±SEM. *(P=0.05) statistical significant difference compared to post-suppression.

as marked dilated blood sinusoids and blood vessels in the red pulp. There was also depletion of lymphocytes in the PALS and B-cell area. Group six histology was marked by loss of the normal red and white pulp pattern in most parts of the spleen.

Discussion

Weight gain, which was appreciable in the low dose bitter leaf group, suggests that ingestion of bitter leaf in moderation may not be associated with decrease ingestion of feeds or loss of appetite. However, the high dose as well as the levamisole groups were associated with more decrease weight gain compared with the control, which may be due to their effects on decrease intake of feeds. This is similar to findings in a study where administration of levamisole was associated with weight loss¹⁰. The insignificant CD4 difference obtained between the control and other groups may be due to the low dose of prednisone used, and/or the short duration of administration. However, another researcher documented that use of low dose prednisone stabilized the CD4 count of subjects when compared with control¹¹.

Levamisole is an imidathiazoles, which is an immunostimulant as it stimulates cell mediated immunity⁴. This study shows that administration of levamisole did not prevent decrease in CD4 count, suggesting that levamisole may not be effective in preventing decrease CD4. This finding is corroborated by some other studies where they similarly found decrease in CD4 count despite administering levamisole for immune boosting to subjects^{10,12}. However, an Indian study suggested the contrary^{10,13}.

Vernonia amygdalina is commonly consumed as a vegetable and has been thought may alter the immune system. However, high and low dose have given varied results. While the high dose VA showed increase in CD4 count, which is similar to findings by Momoh, the low dose was associated with a decrease in CD4, though both were not significant statistically^{14,15}. This insignificant finding may be due to the shorter duration of the administration.

The haematologic parameters of significant decrease in RBC count and haemoglobin level following levamisole administration shows that levamisole suppresses the haemopoetic system or destroys the red blood cells, though there was no significant difference in these parameters. A study where an overdose of this drug was administered corroborates our finding, though this study used a physiological dosage^{4,16}. However, levamisole has a short elimination half-life of three to 4 hours, making toxicity going unnoticed⁴. Similarly, the significant decrease in haemoglobin level in the bitter leaf groups shows that VA may predispose to red blood cells destruction. However, some other studies found no difference in these haematologic parameters, even after prolonged administration^{15,17,18}.

Vernonia amygdalina predisposes to thrombocytosis much higher than levamisole, which may be beneficial as adjunctive therapy in subjects with thrombocytopenia. In addition, the white blood cell count was also much decreased compared with levamisole, which is suggestive that bitter leaf has anti-inflammatory properties. This finding contrasts studies that have suggested levamisole enhancing the innate immune system through its induction of leukocytosis, neutrophilia and lymphocytosis. However, these contrasting studies administered the parenteral route unlike the oral route used in this study^{4,16,19}.

A decrease in cellularity of the parts of spleen histologically depicts decrease cells dominating the area. This is as seen with the groups that had *Vernonia amygdalina* and levamisole administered. These groups were associated with decrease in both T- and B-lymphocytes as these are represented by decrease in the size of PALS and marginal zone respectively. This suggests that VA as well as levamisole, may predispose to decrease humoral immune responses as well as T-cell mediated immunity. The marked loss of splenic architecture in levamisole administered rats may be explained by decrease in number as well as size of the parts of the white pulp, which is also corroborated in another publication though Olusi had a contrary documentation of improved T-cell immunity^{20,21}.

In conclusion, *Vernonia amygdalina* predisposes to decrease haemoglobin concentration while both levamisole and *Vernonia amygdalina* are associated with decrease immune responses. The use of levamisole at intervals and its effects as compared to continuous use needs to be studied as well as prolonged use of bitter leaf, in order to further substantiate these findings.

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References

- Farombi EO and Owoeye O. Antioxidative and Chemopreventive Properties of *Vernonia amygdalina* and *Garcinia biflavonoid*. Int J Environ Res Public Health. 2011; 8(6):2533–55.
- Huffman M. and Seifu M. Observations on the illness and consumption of a possibly medicinal plant *Vernonia amygdalina* by a wild chimpanzee in the Mahale Mountains National Park, Tanzania. *Primates*. 1989;30(1):51–63.
- Sweeney C, Mehrotra S, Sadaria M, Kumar S, Shortle N, Nakshatri H, *et al*. The sesquiterpene lactone parthenolide in combination with docetaxel reduces metastasis and improves survival in a xenograft model of breast cancer. *Molecular Cancer Therapeutics*. 2005;4(6):1004–12.
- Asaad CS. Haematological parameters after oral administration of levamisole with its activity on nonspecific immunity and total serum protein in sheep. Kufa journal for Veterinary Medical Sciences. 2016;6(1):1–7.
- Liu D, Ahmet A, Ward L, Krishnamoorthy P, Mandelcorn ED, Leigh R, *et al*. Moringa Oleifera leaves: Immunomodulation in Wistar albino rats. Int J Pharm Pharm Sci. 2011;3(5):426–30.
- Gaikwad SB, Mohan GK, Reddy KJ, Moringa oleifera leaves: Immunomodulation in wistar albino rats. Int J Pharm Pharm Sci. 2011;3(5):426–30.
- Otali D, He Q, Stockard CR, Grizzle WE. Preservation of immunorecognition by transferring cells from 10% neutral buffered formalin to 70% ethanol. *Biotech Histochem*. 2013;88(0):170–80.
- Gray DW, Millard PR, McShane P, Morris PJ. The use of the dye neutral red as a specific, non-toxic, intra-vital stain of islets of Langerhans. *Brit J Exp Pathol*. 1983;64:553–8.
- Fischer AH, Jacobson KA, Rose J, Zeller R. Hematoxylin and eosin (H & E) staining. CSH Protoc. 2008. [http://dx.doi.org/10.1016/0016-5085\(95\)23032-7](http://dx.doi.org/10.1016/0016-5085(95)23032-7), pdb.prot4986
- Mansouri F, Janbakhsh A, Vaziri S, Sayad B, Afsharian M, Hosseini F, *et al*. Comparative study of levamisole-selenium supplementation effect on CD4 increase in HIV / AIDS patients. *Caspian J Intern Med*. 2011;2(2):218–21.
- Albrecht U, Bertisch-Mollenhoff, Frietsch B, Muller M. Low dose prednisolone reduces CD4+ T cell loss in therapy-naïve HIV-patients without antiretroviral therapy. *Eur J Med Res*. 2005;10(3):105–9.
- Gupta M. Levamisole: A multi-faceted drug in dermatology. *Indian J Dermatol Venereol Leprol*. 2016;31(82):230–6.
- Prakash MS, Rao VM, Reddy V. Effect of levamisole on the immune status of malnourished children. *J Trop Pediatr*. 1998;44:165–6.
- Momoh MA, Muhamed U, Agboke AA, Akpabio EI, Uduma EO. Immunological effect of aqueous extract of *Vernonia amygdalina* and a known immune booster called immunace® and their admixtures on HIV/AIDS clients: a comparative study. *Asian Pac J Trop Biomed*. 2012;2(3):181–4.
- Eyong EU, Atangwho IJ, David-Oke E, Agiang MA, Ebong PE. Haematological and immunological effect of co-administration of extracts of *Vernonia amygdalina* and *Azadirachta indica* on normal and diabetic rats. *Afr J Biotechnol*. 2011;10(50):10258–62.
- Gokce HI, Gunes V, Erdogan HM, Cital M, Akca A, Yuksek N. The effects of levamisole poisoning on the haematological and biochemical parameters in dogs. *Dtsch Tierarztl Wochenschr*. 2004;111(2):81–5.
- Atangwho IJ, Edet EE, Egbung GE, Uti DE, Ebong PE. Effect of *Vernonia amygdalina* supplemented diet on selected tissues function in diet-induced obese rats. *J Med Plants Res*. 2013;7(25):1825–32.
- Oleforuh-Okoleh VU, Olorunleke SO, Nte IJ. Comparative response of bitter leaf (*Vernonia amygdalina*) infusion administration on performance, haematology and serum biochemistry of broiler chicks. *Asian J Anim Sci*. 2015;9(5):217–24.
- Refat SA, Abo EEH, Riham ME, Omama MS. Biochemical and pathological effects of closantel and levamisole in female rabbits. *Benha Veterinary Medical Journal*. 2011;22(2):136–44.
- El-Sady E, Galal M, El-Morsy A. histological effects of the long term administration of levamisole on the spleen of the rat. *Sci Med J Cai Med Synd*. 1990;2(2):39–51.
- Olusi SO, Jessop WJE, Shoroye A. effects of levamisole on the immune responses of experimentally malnourished rats. *Pediat Res*. 1979;13:1237–9.

Indications and Early Post-Operative Complications of Major Limb Amputations in University of Ilorin Teaching Hospital, Ilorin

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Abstract

Major limb amputation (MLA) is an amputation at or proximal to the wrist or ankle and has been practiced for centuries for a variety of reasons which change with community dynamics over time. In the last 2 decades, no study has been carried out on the current indications and early post-operative complications profile in this centre hence the reason for this study.

Consenting patients with indications for MLAs were recruited and prepared for amputation following standard operating procedure. A standard protocol for post-operative management was carried out tailored to each patient's need. Discharge was considered when patient was fit.

Fifty-three patients were recruited with a male:female ratio of 2.8:1. The mean age was 42 $\pm$ 19.8yrs while the peak age range was 21 – 30yrs (32.1%). Majority (28%) were traders and trauma (34%) was the leading indication for amputation followed by diabetic foot gangrene (22.6%). Road traffic accidents accounted for 66.6% of all trauma cases while the mean waiting period before surgery was 7days. Amputations were commoner on the right side of the body (52.8%), in the lower limbs (84.9%) and below knee amputation was the commonest (58.7%). The early post-operative complication rate was 66%, the commonest complication was wound infection while the mortality rate was 5.7%. No patient (0%) was fitted with prosthesis prior to discharge or during follow up.

Trauma remains the commonest indication for amputation in this centre and is predominant among young active males. Diabetic foot gangrene follows closely as the commonest non-traumatic cause.

Keywords: Major limb amputation, Indications for Amputation, Early post-operative complications, Ilorin

Introduction

Amputation is an ancient procedure which has been carried out for therapeutic, punitive and ritual reasons.¹ Major limb amputation is an amputation at or proximal to the wrist and ankle. This is a common surgical procedure carried out in centres around Nigeria and trauma is one of the most common indications in this part of the world.³⁻⁹

In the United States, 30, 000 – 40, 000 amputations are done annually, the commonest indication is peripheral vascular disease representing about 82% of all limbs amputated and this has been on the increase in contrast to other indications such as trauma, tumors, congenital abnormalities and diabetic foot gangrene.¹⁰

In Africa, trauma has been the commonest indication for extremity amputation resulting mostly from road traffic accidents.¹¹⁻¹³ In Nigeria, trauma is the leading indication for extremity amputations in many centres however some centres report that diabetic foot gangrene was the commonest. Other common indications include traditional bone setter's (TBS) gangrene, infections, tumors, congenital abnormalities and peripheral vascular disease.^{2,4,5,8,11,14-18} Rarer indications are nuisance limbs, burns and snake bites.^{4,19} Major Limb amputations are 3 times commoner in males than in females, involving people between the ages of 27 – 36yrs and mostly performed below the knee.^{2,3-9,11,13,17,20}

The decision to amputate is a crucial one, therefore limb salvage whenever possible should be considered. Limb salvage has reduced the incidence of whole limb amputations in developed countries where facilities such as sophisticated imaging and micro-surgical techniques exist though multiple surgeries may eventually be required.^{6,18,20} The study aims to determine the indications and common early post-operative complications of major limb amputations in University of Ilorin Teaching Hospital, Ilorin.

Patients & methods

This was a prospective descriptive hospital based study carried out in the University of Ilorin Teaching Hospital, Ilorin over a 12 month period (Nov 2010 – October 2011). Ethical approval was obtained and prospective patients were recruited through Accident and Emergency and out-patient clinics. Informed consent was obtained and each patient was evaluated, examined and a structured questionnaire was filled and updated as the patient's management was

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on-going. Information such as age, sex, occupation, level of education, indication for amputation, time of injury, time of presentation, time of surgery, level of amputation, laterality, duration of hospital stay, development of complications and mortality amongst other parameters were obtained.

Pre – operative anaesthetic review was carried out and appropriate anaesthesia was administered depending on age and site of amputation. The use of tourniquet was individualised. Amputation was carried out following standard procedure.¹³⁻¹⁴ Patients were followed up for 3 months to assess early post-operative complications such as soft tissue infection, haemorrhage, phantom sensation and mortality.

The data generated was collated and sorted out for errors. Statistical analysis was carried out using SPSS version 17 software (IBM, New York, USA). Results were presented with the aid of tables, graphs and charts. The Pearson's chi – square and Fisher's Exact test were used to determine the statistical significance between qualitative variables. Relationship of differences with p value < 0.05 was accepted as significant.

Results

Fifty-three patients with 53 limbs were recruited into the study with age range between 4 –

84yrs (mean = 42 ± 19.8 yrs). The paediatric age group (< 15yrs) made up 5.7% (n= 3) of all patients while the peak age group was 21 – 30 years (table I). There were 39 males (73.6%) and 14 females (26.4%) with a M:F ratio of 2.8:1. A significant proportion were traders (n=15;28.3%) who were of low economic class (fig 1). Of those with western education (n= 44;83%), those with primary and tertiary education were of equal occurrence as seen in fig 2.

Trauma was the leading indication for amputation (n=18; 34%) followed by diabetic foot gangrene (n=12;22.6%) and traditional bone setter (TBS) gangrene (n=12;22.6%) (table II). Road traffic accidents (72.2%), assault (17.2%) and gunshot injuries (5.6%) were the three most common forms of trauma (table III). A statistically significant relationship between the age and indications for amputation was found ($p < 0.05$). Patronage of traditional bone setters at onset of illness accounted for 45.3% (n=24) followed by 34% (n=18) of patients who presented to private and general hospitals. There was a significant relationship between place of presentation and level of education ($p = 0.014$).

There were 51 trans-osseous amputations and 2 disarticulations. In relation to laterality of amputation, 52.8% (n=28) were performed on the right and 47.2% (n=25) were on the left limb. There were no

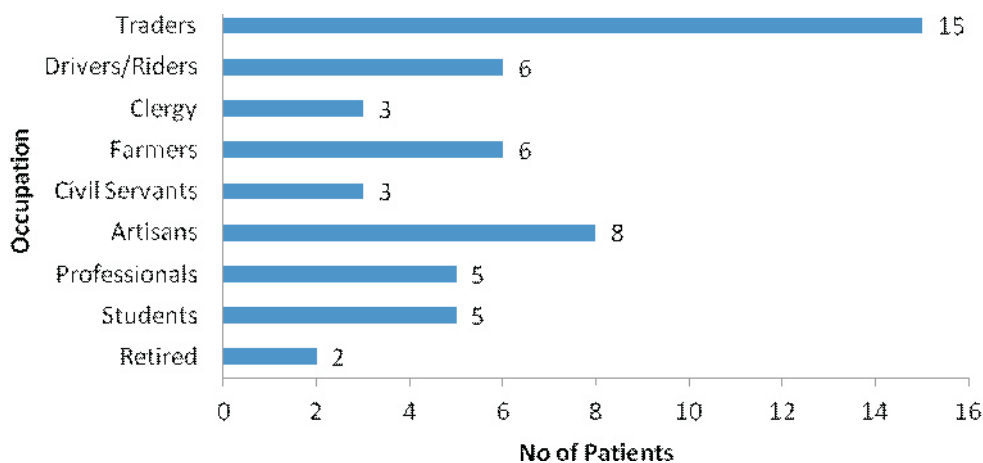


Fig 1. Bar chart showing Occupational Distribution of patients

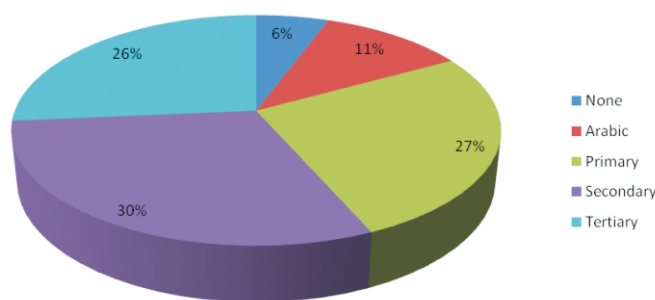


Fig 2: Pie chart showing Level of Education of patients

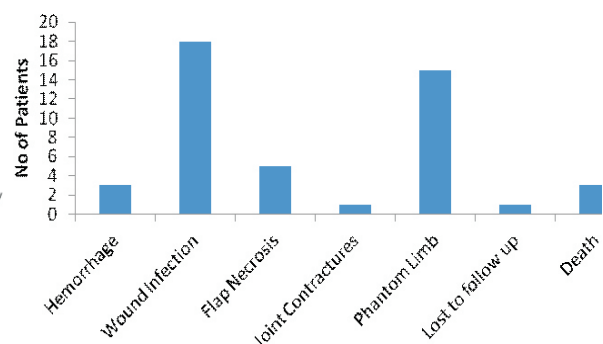


Fig 3: Bar chart showing the pattern and frequency of Early Post-Operative Complications

ribution
Table I: Age Group Frequency Dist

Age Group (Yrs)	No of Patients (n)	Percentage (%)
< 10	3	5.7
11 – 20	-	-
21 – 30	17	32.1
31 – 40	8	15.1
41 – 50	7	13.2
51 – 60	8	15.1
61 – 70	4	7.5
71 – 80	5	9.4
81 >	1	1.9
Total	53	100.0

Table III: Types of Trauma

Type of Trauma	No of Patients (n)	Percentage (%)
Road Traffic Accidents	13	72.2
Industrial Accidents	1	5.6
Gunshot Injuries	1	5.6
Assault	3	16.6
Total	18	100.0

Table V: Waiting Period prior to Surgery and Duration of Hospital stay

Waiting Period (days)	No of Patients (n)	Percentage (%)
<7	40	75.5
8 – 14	8	15.1
15 – 21	4	7.5
22 – 28	-	-
29 – 35	1	1.9
Total	53	100.0

Duration of Hospital Stay	No of Patients (n)	Percentage (%)
<7	1	1.9
8 – 14	2	3.8
15 – 21	5	9.4
22 – 28	18	34.0
29 – 35	12	22.6
36 – 42	6	11.3
43 – 49	4	7.5
50 – 56	2	3.8
57 – 63	1	1.9
64 – 70	-	-
71 – 77	2	3.8
Total		100.0

bilateral amputations performed during the study period. Lower limb amputations accounted for 84.9% (n=45) of all major limb amputations and included 30 (56.6%) below the knee and 14 (26.4%) above the knee. Of the 15.1% representing upper limb amputations, 9.4% (n=5) were above the elbow and 3.8% (n=2) were below the elbow (Table IV). The mean waiting period prior to surgery was 5.7 days (range 1 – 29 days) with 75.5% (n=40) of patients having their surgeries within the first week of admission (Table v). The mean duration of hospitalization was 32 days (range 3 – 73 days); 18 (33.96%) patients spent between 22 – 28 days

Table II: indication for Amputation

Indications for Amputation	No of Patients (n)	Percentage (%)
Trauma	18	34.0
TBS Gangrene	12	22.6
DM Foot Gangrene	12	22.6
Peripheral Vascular Disease	6	11.3
Infections	1	1.9
Burns	1	1.9
Tumors	3	5.7
Total	53	100.0

Table IV: Level of Amputation

Level of Amputation	No of Patients (n)	Percentage (%)
Below Knee	30	56.6
Above Knee	14	26.4
Above Elbow	5	9.4
Below Elbow	2	3.8
Knee Disarticulation	1	1.9
Elbow Disarticulation	1	1.9
Total	53	100.0

on admission. (table V)

Early post-operative complication rate was 66% (n=35) and of these, the common complications observed were post-operative wound infections (n=18;51.4%), phantom limb (n=15;42.9%), flap necrosis (n=5;14.3%) and post-operative hemorrhage (n=3;8.6%) (Fig 3). Indication for amputation was statistically associated with time of presentation (p=0.001) and the development of complications while no relationship exists between development of complications and waiting period prior to surgery. The mortality rate was 5.7% (n=3).

All patients who had lower limb amputation were discharged with an ambulatory aid such as bilateral axillary crutches (n=40;93%) and wheelchairs (n=3;7%). No patient had prosthetic fitting prior to or after discharge.

Discussion

The goal of an amputation is to eliminate a potential threat to the patient's life and reconstruction of the residual stump to facilitate prosthetic fitting and rehabilitation.²⁰

The young age group represent the most active and mobile members of the society and as such are susceptible to trauma. Studies in Ilorin, Maiduguri and Kenya reported findings stating that major limb amputations are be commoner in this age group.^{2,3,5,7,8} The significant relationship found between the age of patients and indications for amputation in this study implies that different indications for amputation affect different age groups; therefore post traumatic amputations are commoner in younger age group while

non-traumatic causes e.g. gangrene from DM foot and PVD are commoner in the middle age group and the elderly. The presence of systemic illnesses in the latter group might have been a contributing factor. The preponderance of males found in this study and many other centres may be because they are more active and adventurous and are thus disproportionately injured.^{3,6,8,9,11}

Road traffic accidents are commoner in traders and could even be described as an occupational hazard since they commute long distances during the course of their business. In Maiduguri, farmers were found to have made up a large portion of patients who had major limb amputations probably because the population in question are largely rural dwellers, live far away from hospitals and as such depend more on traditional bone setters in the event of injury or disease.³

Major limb amputations were commoner in patients who had secondary education (fig 2) in this study while in Kenya those with primary education were in the majority. The assumption is that the lower level of education, the more likely the patient will patronize traditional bone setters. However there was no association between both variables.

Indications for major limb amputations found in this study are as listed in table II. Trauma being the most common indication is followed by diabetic foot gangrene. Road traffic accidents continue to be the commonest cause of major limb amputations of traumatic origin followed by industrial accidents comparable to the finding in Ile-Ife.⁶ (table III). Solagberu observed an increasing incidence of Diabetic foot gangrene as an indication for amputation in this centre about two decades ago but trauma was the leading cause.⁹ Reasons that may be adduced include the deplorable state of our roads, use of suboptimal tyres, vehicles and machines, lack of use of protective gadgets among other things.

Mismanagement of fractures by traditional bone setters (TBS) have also resulted in major limb amputations.^{4,16} An analysis of the primary cause resulting into TBS gangrene in this study shows that all these patients were involved in road traffic accidents prior to presentation at the traditional bone setters.

Peripheral vascular disease (PVD) though said to be uncommon in developing countries was also observed in this study (n=6;11.3%). This is similar to reported incidences of amputation resulting from PVD which were 11.8% in Lagos and 10.2% in Maiduguri. This is in contrast to developing countries where the incidence could be as high as 82%.¹⁰ Tumors resulted in 5.7% of major limb amputations in this study ranked low (4th) in the indications for amputation as previously observed.⁹ In Maiduguri, though the incidence of amputations resulting from tumors is higher (18.4%), it is the second most common indication after trauma.^{3,8,11} It is expected that patients with a higher level of

education will present to hospital at onset of awareness of illness thereby reducing the presentation time while those with lower level of education may initially present to traditional bone setters however, no association was found.

The emergent nature of trauma ensures that awareness is immediate and thus time of presentation to hospital is short. This was evidenced by a statistically significant relationship. In contrast, patients with tumors present late because awareness of the illness is late.

It will also be noted that patients who had TBS gangrene and DM foot gangrene presented within the same duration. This may have been due to the undeniable presence of gangrene, pain, purulent foul smelling discharge and the associated embarrassment. Lengthy time of presentation is however more common amongst patients with tumours.¹¹ They are known to present only when there is a change or progression of symptoms.

The place of initial presentation is defined as a facility where the patient presented to at onset of illness. These include the Teaching Hospital (UTH), private/general hospitals and traditional bone setters (TBS). Majority (n=24;45.3%) of patients presented to traditional bone setters in this study. This high patronage could be due to tradition, cultural practices and beliefs, lack of trust in orthodox medicine, presumed high cost of orthodox care, the attitude of health workers, greater empathy and provision of quicker service by TBS thereby avoiding the long waiting period before treatment in tertiary/government hospitals.²¹ This implies that the lower the level of education, the more likely that the patient will visit traditional bone setters while those with a higher level of education most likely visit orthodox health services for treatment. Though patients with a higher level of education may present to TBS.²² In quite a number of cases, the decision to patronize the TBS was not the patients' but by the parent or relative in charge of footing the bill.²³ Complications following management by TBS include gangrene, infections, joint ankylosis, mal-unions and non-unions.^{4,7,16} Inappropriate splinting or occlusive bandaging of the injured limb without allowing soft tissue swelling to resolve results in vascular occlusion distal to the applied splint, external compartment syndrome and subsequent gangrene.^{4,5,7,8,14,16}

Below the knee amputation was the commonest procedure carried out followed by above knee amputation and this is the trend in most other centres.^{2,4,6-9,11,13,24} All patients in this series had unilateral amputations with a predilection for the right side of the body for both the upper and lower limbs. In Zambia bilateral amputations accounted for 10% of all amputations.¹³ In Britain, the laterality of amputations in 2000 DM foot gangrene patients were studied and a

propensity for the right limb was discovered. It was postulated that the difference in laterality of amputation could be as a result of cumulative physical stress or pressure applied to the foot an individual favours in starting and stopping during movement.²⁵ The laterality of amputations is most important in the upper limb and principally in relation to handedness and occupation of the patient as the rehabilitation of a right handed person who loses his right hand would be more difficult.

The waiting period prior to surgery was found to be 5.72 days (SD 5.48) in 75.5% (n=40) of patients. This is considerably less than that found in Lagos where the waiting period was between 10.4 – 11.8 days.¹¹ Financial constraints, refusal to give consent and logistics problems were the main reasons for this delay.^{26,27} Resuscitation on presentation is important for optimum operative outcome if the “second hit” phenomenon is to be avoided.²⁶ This may also have contributed to prolonged waiting period.

The duration of hospital stay in this study was found to be similar to that observed in other centres.^{7,11} This may be as a result of prolonged waiting period before surgery, delay in giving consent, financial constraints and the presence of post-operative complications notably wound infection.⁶ Other reasons include prosthetic fitting, procurement and wound healing. In the elderly, the presence of co-morbid illnesses and development of nosocomial infections has been shown to prolong the duration of hospital stay.

The complication rate observed was 66%. Early post-operative complications were observed in a considerable number of patients during the study with over 50% of them having developed one or a combination of complications. The most common early post-operative complication encountered was wound infection of the residual stump regardless of the indication followed by phantom limb sensation and flap necrosis (fig 3). This may be due to the degree of wound contamination or ascending infection which could not be assessed prior to or during surgery. This trend was also the finding in some centres.^{6,11} The development of phantom limb is a consequence of the procedure and not related to the indication for amputation.²⁸ Our finding is similar to the 55% of British veteran amputees who developed phantom limb following amputation of a major limb.²⁸ It was also found to be most frequent in patients with DM Foot gangrene than in patients who had trauma to the limb.

Mortality rate was 5.7% (n=3). Several workers have found similar mortality rates ranging from 5% - 7.2% which are all consistent with the findings in this study.¹¹

None were fitted with prosthesis due to financial constraints, wound infection, residual ulcers and the relatively difficulty (i.e. cost and availability) in procuring prosthetic limb in our centre. Prosthetic use before surgery was 16% in Lagos probably due to the

presence of a functional prosthetics and orthotic department.¹⁰ Prosthetic use after discharge was found to be 1.8% and 7.5% in Maiduguri and Sagamu respectively.^{3,19}

Conclusion

Trauma is the most common indication for major limb amputations and predominantly in young active males. Below knee amputation is the commonest procedure and predominantly on the right. Wound infection and phantom limb were the main early post-operative complication encountered.

Frequent public enlightenment campaigns on road safety, maintainance of vehicles, safety in the workplace, the dangers of intervention by traditional bone setters and adequate control of blood glucose in diabetics is important if unwarranted limb loss is to be reduced.

References

1. Magee RA. Amputation through the ages the oldest surgical operation. *Aust NZ Surg* 1998; 68:675-678.
2. Umaru RH, Gali BM, Ali N. Role of Inappropriate Traditional Splintage in Limb Amputations in Maiduguri, Nigeria. *Annals of African Medicine*. 2004;3:138–140.
3. Abbas AD, Musa AM. Changing Pattern of Extremity Amputations in University of Maiduguri Teaching Hospital, Nigeria. *Nigerian Journal of medicine*. 2007;16(4):330–333
4. Dada A, Giwa SO, Yinusa W, Ugbeye M, Gbadegesin S. Complications of Treatment of Musculoskeletal injuries by Traditional Bonesetters. *WJMJ*. 2009;28(1):333–337.
5. Thanni LOA, Tade AO. Extremity Amputation in Nigeria - A Review of Indications and Mortality. *Surgeon*. 2007;Vol 5(4):213-217.
6. Olasinde AA, Oginni LM, Bankole JO. et al. Indications for Amputations in Ile-Ife, Nigeria. *Nigerian Journal of Medicine*. 2002;IJ(3):118–121.
7. Obalum DC, Okeke GCE. Lower Limb Amputations at a private Tertiary Hospital. *West African Journal of Medicine*. 2009;28(1):24-27.
8. Garba ES, Deshi PJ. Traditional Bone Setting: A risk Factor in Limb Amputation. *East African Medical Journal*. 1998;75(9):553-555.
9. Solagberu BA. The Scope of Amputations in a Nigerian Teaching Hospital. *Afr J Med Sci*. 2001;30(3):225–227.
10. Janos P Ertl, William Ertl, James W Pritchett. Amputations of the Lower Extremity. 2008; Available from: <http://emedicine.medscape.com/article/1232102-overview>.
11. Yinusa W, Ugbeye ME. Problems of amputation surgery in a developing country. *International Orthopaedics (SICOT)*. 2003;27:121–124.
12. Julius A. Ogeng'o, Moses M. Obimbo, John

- King'ori. Pattern of limb amputation in a Kenyan rural hospital. *International Orthopaedics*. 2009;33(5):1449–453.
13. Shadrack G. Lungu. The Pattern of Lower Limb Amputations in Zambia. *Medical Journal of Zambia*. 2009;36(1):38–42.
14. Musa AA, Ogun SA, Agboola AOJ, Shonubi AMO, Banjo AAF, Akindipe JA. Surgical Complications from Local Herbal Practitioners: Report of Five Cases. *East African Medical Journal*. 2007;84(5):240–245.
15. Nwadiaro HC, Nwadiaro PO, Kidmas AT, Ozoilo KN. Outcome of traditional bone setting in the Middle belt of Nigeria. *Nigeria Journal of Surgical Research*. 2006;8(1-2):44–48.
16. Onuminya JE, Obekpa PO, Ihezue HC, Ukegbu ND, Onabowale BO. Major Amputations in Nigeria: A Plea to Educate Traditional Bone Setters. *Trop Doct*. 2000;30(3):133–135.
17. Appley AG, Solomon L. Appley's System of Orthopedics and Fractures. 8th ed: ELBS Butterworths; 1993. Pg 325–328.
18. Robert Henshaw and Martin Malawer, Review of Endoprosthetic Reconstruction in Limb-sparing Surgery. In: Martin M. Malawer, Paul H. Sugarbaker (eds) *Musculoskeletal Cancer Surgery Treatment of Sarcomas and Allied Diseases*. Kluwer Academic Publishers; 2001. p381–401
19. Abubakar SB, Habib AG, Mathew J. Amputation and disability following snakebite in Nigeria. *Trop Doct*. 2010;40:114–116.
20. Douglas G. Smith, Amputations. In: Harry Skinner (ed): *Current Diagnosis & Treatment in Orthopaedics*. 4th ed. Lange McGraw-Hill; 2006. p645-670
21. Ogunlusi JD, Ikem IC, Oginni LM. Why Patients Patronize Traditional Bone Setters. *The Internet Journal of Orthopedic Surgery*. 2007;4(2).DOI 10.5580/1f53.
22. Eyesan SU, Obalum DC, Onovo DO, Ketiku KK, Abdulkareem FB. Indications for ablative surgery in extremity musculoskeletal tumours. *Nigerian Quarterly Journal of Hospital Medicine*. 2009;19(4):206–209.
23. Nwadiaro HC, Ozoilo KN, Nwadiaro PO, Kidmas AT, Oboiren M. Determinants of Patronage of Traditional Bone Setters in the Middle Belt of Nigeria. *Nigerian Journal of Medicine*. 2008;17(3):356–359.
24. Ofiaeli RO. Indications Level and Outcome of Lower Extremity Amputations in Nnewi, Nigeria. *Journal of Medical Investigation and Practice*. 2001;2:18–21.
25. Coxon JP, Gallen IW. Laterality of Lower Limb Amputation in Diabetic Patients: Retrospective Audit. *BMJ*. 1999;318(7180):367.
26. Adamu A, Maigatari M, Lawal K, M. I. Waiting time for emergency abdominal surgery in Zaria, Nigeria. *Afr Health Sci*. 2010;10(1):46–53.
27. Nasir AA, Adigun IA, Aderibigbe AB, Folarin OO. Audit of emergency throughput of a plastic surgery unit in a developing country. *Ann Afr Med*. 2009;8(4):282–284.
- Wartan SW, Hamann W, Wedley JR, McColl I. Phantom pain and sensation among British veteran amputees. *Br J Anaesth*. 1997;78:652–659.

Chronic Toxicological Evaluation and Reversibility Studies of *Moringa Oleifera* Ethanolic Seed Extract in Wistar Rats

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Abstract

This study evaluated the chronic toxicity and reversibility Potential of *Moringa oleifera* seed in Rats. Forty-four Wistar rats were randomized into four groups of 11 rats each, three groups were treated with doses of 50, 200, and 800 mg/kg of MOESE *p.o.* for 90 days while one group served as control and was administered distilled water *p.o.* After 90 days, half of the animals were sacrificed and blood samples collected for determination of biochemical and haematological parameters; antioxidants and malondialdehyde (MDA); sperm count, motility and morphology. Organs were harvested for weight determination and histopathological assessments the liver. The other half were left for another 30 days without treatment with the extract, after which they were sacrificed. MOESE produced significant reduction in food and water intake, relative weights of liver, heart, testes, lung and spleen at all treatment dose, these changes were overall small magnitude, within the range of historical control. There was significant increase in AST (200 and 800 mg/kg), LDH (200 mg/kg), ALP (800 mg/kg), albumin (800 mg/kg) and K⁺ (800 mg/kg), but decrease in serum Ca²⁺ (50 and 200 mg/kg). A significant increase in serum antioxidant was observed at all treatment doses, while semen pH were reduced. These effects on organ relative weights and all biochemical parameters except AST and ALP were reversed after 30 days of the reversibility study. Histopathological presentations showed necrosis in the liver (50 and 200 mg/kg). Our study demonstrated that ethanol extract of *Moringa oleifera* seeds could cause infertility in male rats due to decreased semen pH. Our results also showed that the extract may be hepatotoxic due to persistent high level of AST and ALP even after cessation of exposure to the extract, this is also consistent with the histopathological results that shows hepatic necrosis associated with chronic exposure to the extract.

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Introduction

Many plants have shown very effective medicinal values for various diseases in humans. As a result, pharmacological evaluation of medicinal plants has recently witnessed a growing interest amongst researchers worldwide. Studies have shown that several of the pharmaceuticals currently available have had a long history of use as herbal remedies.¹ Quinine, antimalarial drug from cinchona bark;² digoxin and digitoxin drugs for heart failure and atrial dysrhythmias from digitalis leaves^{1,3} are examples of the contributions of traditional pharmacopoeia. In Nigeria, despite immense progress in the delivery of health care at the primary health care level, an estimated 75 percent of the population still prefers to solve their health problems by consulting the traditional healers.⁴ In addition, herbal medicines are extensively used in the developing world where they offer a more affordable alternative to pharmaceutical drugs.

Moringa oleifera belongs to the family of moringaceae, a single genus with 14 known species.⁵ It is a fast growing drought resistant tree native of sub-Himalayan tracts of Northern India but now distributed worldwide in the tropics and sub tropics^{6,7} including Nigeria. The seed extracts of *Moringa oleifera* in particular have been reported to possess anti-inflammatory, antioxidant, anticancer, antimicrobial, Hypolipidaemic, antiulcer, antidiabetic, diuretic and hepatoprotective activities.⁸⁻¹³

Various studies have been conducted to investigate biological activities and efficacy of *Moringa oleifera* seed extracts,^{14,15} while little attention is being paid to its toxicity studies. Most of the studies on toxicity of *Moringa Oleifera* were focused on acute and sub-chronic toxicity¹⁴ and none of the studies has a report on reversibility of any toxic effect observed, from MOESE. This study therefore aims to investigate the chronic toxicity of MOESE and possibility of reversal of any toxic effect produced after 30 days of none treatment

Materials and methods

2.1 Identification and Preparation of Seeds Extract:

Moringa oleifera seed was bought from Avuco farms company Ltd, in Kaduna State Northwest Nigeria in

February (2015) and authenticated by a plant taxonomist Professor F.A Oladele of the Department of Plant Biology, University of Ilorin. The plant material was stored in the herbarium of the same department with a voucher number UIH/011/1011.

The seed husk was removed to get the seeds that were then crushed with a clean mortar. One kilogram of the crushed seeds of *Moringa oleifera* was defatted by macerating with 5L of Petroleum ether (BDH) at room temperature and allowed to extract for 72h with intermittent shaking (model 3017 rotary shaker. GFL, Burgwedel, Germany). The solution was filtered and the defatted seed was then re-extracted with absolute ethanol (BDH) for another 72hrs. The resultant extract was then freeze-dried to yield 32.3 g of semi-solid residue. The residue was reconstituted in distilled water and appropriate concentrations were used in the experiments.

2.2 Preliminary Phytochemical Screening

The qualitative analyses of the plants constituents were carried out using the methods described by Harbone.^{16,17} The presence of alkaloids, glycosides, tannins, saponins, terpenoids, flavonoids, glycosides, anthraquinones, volatile oil, and steroids were tested.

Experimental Animals

Forty-four (32 males and 12 females) healthy and matured albino rats (*Rattus norvegicus*) weighing 120-170g were obtained from Animal Housing facility of the Biological Garden of the University of Ilorin, Ilorin, Kwara state, Nigeria. The rats were housed in polycarbonate cages (TECHNIPLAST cages, Italy) in the Animal House facility of the Faculty of Basic Medical Sciences, University of Ilorin, and were maintained under standard conditions with a 12-hour light/dark cycle. A certified rodent chow (Oluwagbemisola feeds) and drinking quality water were available *ad libitum*. Animal use procedures were approved by the Animal Care and Use Committee of the University of Ilorin. Animal care and use was conducted in accordance with the principals stated in the Guide for the Care and Use of Laboratory Animals and in accordance with all applicable regulations. The study was performed in accordance with National Institute of Health (NIH) guidelines for the care and use of laboratory animals.¹⁸

Single Dose Toxicity Study

A single dose study of *Moringa oleifera* ethanolic seed extract (MOESE) was carried out using Lorke's method.¹⁹ A total of 12 healthy and mature male mice, without food for 3-4 hours, were used for the study. In the first phase, 9 of the mice were equally distributed into 3 groups and administered 10mg/kg, 100mg/kg and 1000mg/kg of the MOESE intraperitoneally (*i.p.*), respectively. Mice were

generally observed for toxic symptoms and behavioural changes (Sedation, hyperactivity, diarrhea, writhing, restlessness etc.) for 2h post-administration and mortality for 24h post-administration. In the second phase, 3 mice were given different doses of 1600, 2900, and 5400 mg/kg also intraperitoneally (*i.p.*). They were also observed for symptoms of toxicity and mortality within 24h post-administration. The median lethal dose was calculated using the formula: $LD_{50} = \sqrt{(D_0 \times D_{100})}$; where D_0 is the highest dose that did not cause mortality, and D_{100} is the lowest dose that caused mortality.

Repeated Dose Toxicity Study

A total of 44 rats were randomly allotted to 4 groups of 8 male (140–170g) and 3 female (120–140g) animals each housed separately in polycarbonate cages. The animals were daily treated p.o. with distilled water (control) and MOESE at doses of 50, 200, and 800 mg/kg (representing one-fourth of the pharmacologically active dose, the pharmacologically active dose, and four times the pharmacologically active dose respectively²⁰ for 90 days. All treatments were administered via oral gavage.

All animals were observed daily for clinical signs (hyperactivity, diarrhea, depression, behavioral changes, etc.). Food and water intake were measured daily while the animals' body weights were taken pre-exposure, and weekly during exposure. At the end of the 90 day treatment period, 5 rats from each group were comatosed by cervical dislocation. Blood samples were collected from the rats via the descending aorta and cardiac puncture, into non-heparinized tubes for determination of biochemical and antioxidant parameters, and into EDTA (ethylenediamine-tetra acetate) bottles for haematological parameters, respectively. Semen was obtained from the epididymis of the male animals for semen analysis. Vital organs including the heart, lungs, spleen, kidneys, lungs, testes and pancreas were excised, carefully observed for gross lesions, and weighed. The organs were then preserved in 10% formaline for histopathological assessment. Mortality in each treatment group was recorded during the course of the 90 day administration of MOESE.

Reversibility Study

The remainders of the animals were left without MOESE administration for thirty (30) days for the reversibility studies, with food and water *ad libitum*. At the end of the 30 Days, rats were comatosed by cervical dislocation, and assays conducted in the main study were carried out.

Biochemical Analysis

The blood samples collected were allowed to clot, and then centrifuged at 3000rpm for 5 min to

obtain the serum. The serum was analyzed for liver function parameters (AST, ALT, ALP, albumin, total bilirubin and conjugated bilirubin), kidney function parameters (creatinine, urea, glucose and uric acid) and serum lipid profiles (total cholesterol, HDL, LDL and triglycerides) using commercial kits (Randox Laboratories Ltd., United Kingdom). Total protein concentration was determined using biuret method.^{21,22} Serum electrolytes concentrations were determined by established methods: sodium and potassium concentration by flame photometry, chloride and bicarbonate concentration by titrimetric method, and calcium concentration by cresol-phthalein complexone method.²³⁻²⁵

Determination of *in vivo* antioxidants and malondialdehyde (MDA) levels

Superoxide dismutase (SOD), glutathione peroxidase (GPx), and malondialdehyde (MDA) were determined according to established methods,²⁶ using standard kits (Biorex Diagnostics, United Kingdom).

Haematological Analysis

Blood samples were analyzed using established procedures by automated haematology analyzer. Parameters analyzed include packed cell volume (PCV), red blood cell (RBC) count, haemoglobin (Hb), platelet count, total and differential white blood cell (WBC) count, mean cell haemoglobin concentration (MCHC), mean red cell volume (MCV), and mean cell haemoglobin (MCH).

Sperm Analysis

Sperm analysis to assess seminal fluid for motility, count and morphology was carried out according to the methods of Cheesbrough, 2000²⁷ and Ogli et al. 2009.²⁸ Male rats were comatosed and strapped astride on their back on dissecting board. The testis was removed with its ipsilateral epididymis into a beaker after incision on the right scrotum. Subsequently, semen was expelled out of the epididymis into a beaker placed in water bath at 36°C.²⁸ (Ogli *et al.*, 2009).

Sperm Motility

Semen (10–15 µl) was placed on a slide in a way that the spermatozoa were evenly distributed and covered with a glass. After appropriate focus, several fields of the specimen were assessed for motility using the 40 × objective of the microscope. The number of motile cells was noted out of a total of 100 spermatozoa.

Sperm Count

Using sodium bicarbonate-formalin diluting fluid, a 1 in 20 dilution of semen was carried out with thorough mixing. An improved Neubauer ruled chamber was filled with well-mixed diluted semen

using a Pasteur pipette. The number of spermatozoa in an area of 2 sq mm was counted using the 10 × objective of the microscope after 3–5 min. Estimation of the number of spermatozoa in 1 ml of fluid was done by multiplication of the number counted by 100 000.

Sperm Morphology

A thin smear of the liquefied well-mixed semen, made on a slide, was fixed with 95% v/v ethanol while still wet for 5–10 min. This was allowed to air-dry after which it was washed with sodium bicarbonate-formalin solution. This was to remove any present mucus. Rinsing with water was carried out many times. Subsequently, the smear was covered with dilute carbon fuchsin (1 in 20). This was allowed to stain for 3 min and the stain was washed off with water. Dilute Loeffler's methylene blue (1 in 20) was used to cover the smear for 2 min to achieve counterstaining. This was washed off with water, drained and allowed to dry. Normal and abnormal spermatozoa were examined using the 40 × objective of the microscope. Estimation of percentage normal and abnormal morphology was done from the counting of hundred spermatozoa.

Histopathological Study

Liver obtained from experimental animals were fixed in 10% formol-saline were dehydrated in graded alcohol, embedded in paraffin, and cut into 6µm thick sections. Hematoxylin-eosin was used to stain the sections for photomicroscopic assessment.²⁹ Slides were examined using the × 40, × 100, and × 400 objectives.

Statistical Analysis

Data were expressed as the mean ±SEM and statistically analyzed by one-way analyses of variance (ANOVA). Comparisons between control and treatment groups were made by LSD and Dunnet's post-test, using SPSS (version 17) statistical software. Values of $p \leq 0.05$ were considered significant.³⁰

Results

Acute Toxicity

No mortality and visible signs of toxicity were observed upon administration of MOESE *i.p* at doses of 10, 100 and 1000mg/kg using Lorke's method. Writhing, grooming, and decreased locomotor activity were the behavioral manifestations observed at 1600 and 2900 mg/kg. Mortality was recorded at the highest dose of 5400mg/kg within an hour of administration, with the LD₅₀ estimated to be 3957.27mg/kg.

Effect of MOESE on Body and Organ Weights

The change in body weight of the male and female rats treated with MOESE doses (50, 200 and 800 mg/kg b.w) for 90 days are presented in Figures 1 and 2 respectively. In respect to male rats, MOESE at the dose

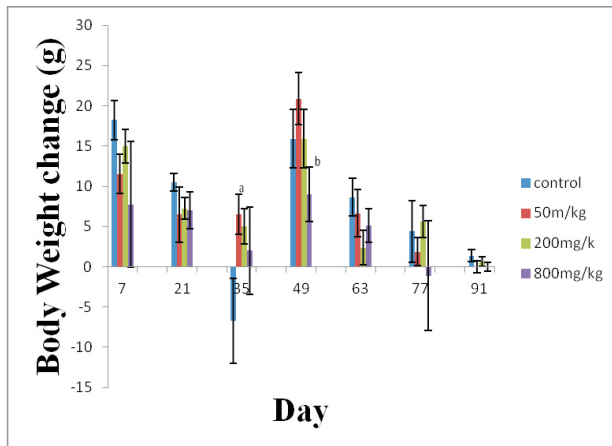


Fig.1: Effect of MOESE on body weight change of male rats in the main (90 day) study. Values are mean $\pm$ SEM. (n = 8).

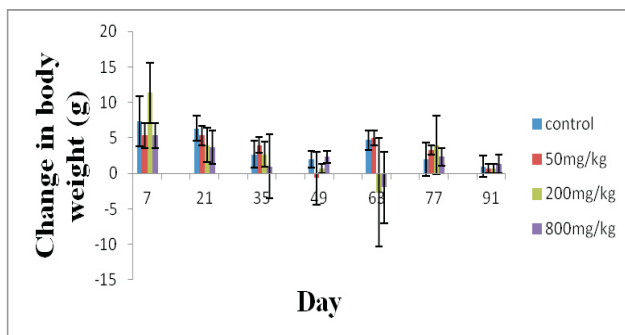


Fig. 2: Effect of MOESE on body weight change of female rats in the main (90 day) study. Values are mean $\pm$ SEM. (n = 3).

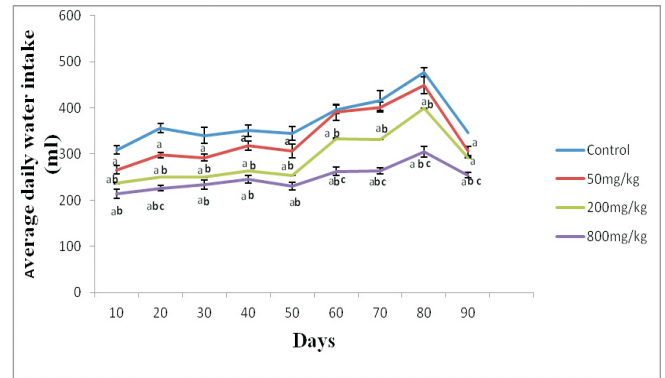


Fig. 4: Effect of MOESE on daily water intake of rats in the main (90 day) study. Values are mean $\pm$ SEM. (n = 11).

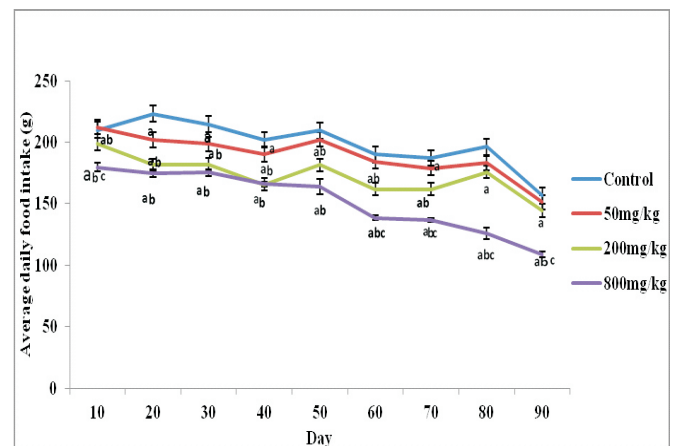


Fig. 3: Effect of MOESE on daily food intake of rats in the main (90 day) study. Values are mean $\pm$ SEM. (n = 11).

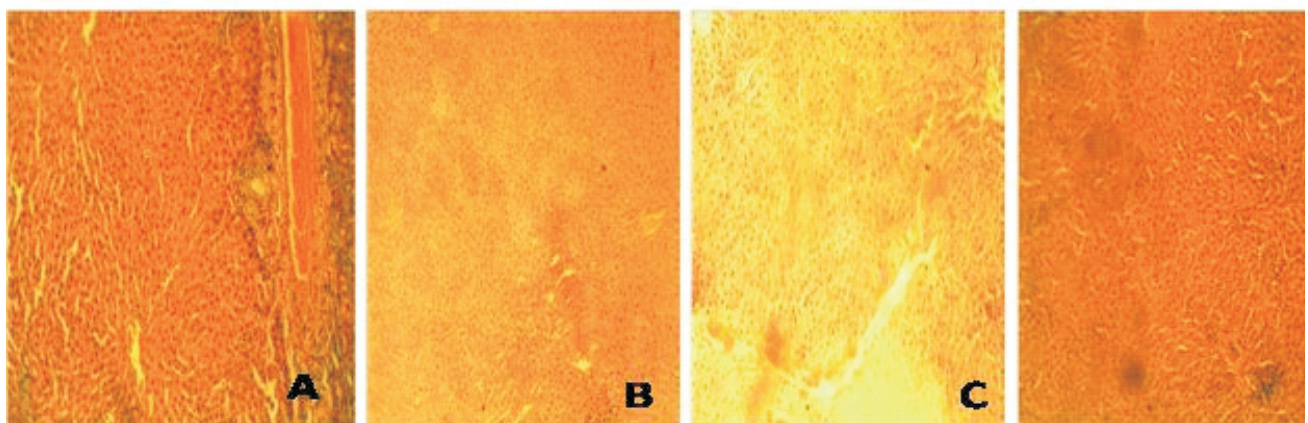


Figure 5. Photomicrograph of transverse section of the liver of rats administered with distilled water and ethanol extracts of *M. oleifera* seed for 90 days. A: Distilled water treated liver shows normal hepatic plates and hepatocytes with normal histological features and intact stroma; B: 50 mg/kg body weight ethanol extract of *M. oleifera* treated liver shows dilated blood vessels and areas of marked hepatic necrosis; C: 200 mg/kg body weight ethanol extract of *M. oleifera* treated liver shows dilated blood vessels, sinusoidal haemorrhage and extensive areas of necrosis; D: 800 mg/kg body weight ethanol extract of *M. oleifera* treated liver shows dilated blood vessels and extensive areas of necrosis. H. magnification 400 $\times$.

Table 1: Effect of MOESE on relative organ weight of rats in the main (90 day) study

Dose (mg/kg)	Liver	Kidney	Lungs	Heart	Testes	Spleen	Pancreas	Brain
Control	3.01±0.02	0.29±0.01	0.79±0.02	0.32±0.00	0.74±0.08	0.39±0.01	0.25±0.02	0.68±0.03
50	2.66±0.06 ^a	0.28±0.01	0.71±0.02 ^a	0.29±0.01	0.82±0.01	0.29±0.01 ^a	0.28±0.02	0.70±0.01
200	2.53 ±0.02 ^{ab}	0.27±0.00	0.57±0.01 ^{ab}	0.27±0.01 ^a	0.48±0.01 ^{ab}	0.31±0.01 ^a	0.36±0.01 ^{ab}	0.77±0.04 ^a
800	2.79±0.01 ^{abc}	0.29±0.01	0.59±0.02 ^{ab}	0.31±0.01 ^c	0.49±0.02 ^{ab}	0.27±0.02 ^a	0.29±0.01 ^c	0.65±0.01 ^c

Values are mean ± SEM. (n = 5).

Table 2: Effect of MOESE on organ weight of rats in the reversibility study

Dose (mg/kg)	Liver	Kidney	Lungs	Heart	Testes	Spleen	Pancreas	Brain
Control	2.85±0.03	0.24±0.01	0.84±0.05	0.31±0.00	0.98±0.05	0.33±0.02	0.37±0.06	0.74±0.03
50	2.86±0.06	0.28±0.01 ^a	0.76±0.02	0.30±0.00	0.94±0.04	0.33±0.00	0.44±0.03	0.88±0.08
200	2.76±0.04	0.26±0.00 ^a	0.79±0.02	0.33±0.01	0.99±0.04	0.20±0.10	0.32±0.03	0.96±0.02 ^a
800	2.77±0.11	0.29±0.00 ^a	1.20±0.31	0.30±0.01	1.04±0.03	0.31±0.01	0.29±0.01	0.86±0.02

Values are mean ± SEM. (n = 5).

Table 3: Effect of MOESE on liver function parameters in rats in the main (90 day) study

Dose (mg/kg)	AST (u/L)	ALT (u/L)	ALP (u/L)	Protein (g/L)	Albumin (g/L)	TB (μmol/l)	CB (μmol/L)
0	234.33	47.33	84.67	47.33	18.33	8.33	0.23
	±1.20	±1.20	±1.76	±0.67	±0.33	±0.33	±0.03
50	223.00	46.00	84.33	52.00	20.67	8.33	0.367
	±21.00	±2.65	±0.88	±1.53	±1.20	±0.67	±0.03
200	356.33	45.00	81.33	48.00	20.33	9.00	0.33
	±22.66 ^{ab}	±2.65	±1.33	±0.58	±0.33	±0.58	±0.03
800	330.00	47.33	91.00	52.33	21.67	8.33	0.23
	±2.89 ^{ab}	±0.67	±0.58 ^{abc}	±3.18	±1.45 ^a	±0.33	±0.07

Values are mean ± SEM. (n = 5).

Table 4: Effect of MOESE on liver function parameters in rats in the reversibility study

Dose (mg/kg)	AST (u/L)	ALT (u/L)	ALP (u/L)	Protein (g/L)	Albumin (g/L)	TB (μmol/l)	CB (μmol/L)
0	139.67	42.33	90.33	66.67	23.00	0.57	0.20
	±0.88	±2.19	±1.33	±1.45	±0.00	±0.03	±0.05
50	137.33	37.00	92.00	69.00	25.67	0.53	0.23
	±0.33	±0.00	±1.00	±2.08	±0.88 ^a	±0.08	±0.03
200	268.67	41.00	90.33	65.33	24.00	0.57	0.23
	±0.67 ^{ab}	±0.58	±1.45	±2.85	±1.00	±0.03	±0.03
800	282.67	39.67	99.00	61.33	25.00	0.73	0.23
	±2.03 ^{abc}	±2.40	±0.58 ^{abc}	±1.76 ^b	±0.00	±0.12	±0.03

Values are mean ± SEM. (n = 5).

Table 5: Effect of MOESE on serum kidney function parameters in rats in the main (90 day) study

Dose (mg/kg)	Creatinine (μmol/L)	Urea (mmol/L)	Glucose (mmol/L)	Uric acid (mmol/L)
0	46.33 ± 1.45	8.30 ± 0.15	4.20 ± 0.15	0.38 ± 0.03
50	49.33 ± 2.03	8.23 ± 0.12	4.13 ± 0.15	0.44 ± 0.04
200	48.33 ± 2.40	8.47 ± 0.09	4.30 ± 0.15	0.51 ± 0.04
800	48.33 ± 1.67	8.47 ± 0.07	4.67 ± 0.39	0.43 ± 0.06

Values are mean ± SEM. (n = 5).

Table 6: Effect of MOESE on serum electrolytes in rats in the main study

Dose (mg/kg)	Na (mmol/L)	K (mmol/L)	Cl ⁻ (mmol/L)	HCO ₃ ⁻ (mmol/L)	Ca (mmol/L)
0	133.67± 1.20	6.60± 0.15	88.67± 1.45	21.00± 0.58	3.14± 0.05
50	134.00± 2.31	6.97± 0.12	89.67± 2.60	19.00± 1.52	2.72± 0.19 ^a
200	133.67± 0.33	6.77 ± 0.30	95.00± 1.00	20.33± 0.33	2.67± 0.10 ^a
800	135.00± 1.15	7.30 ± 0.23 ^a	95.00± 3.21	19.33± 0.88	2.82± 0.08

Values are mean ± SEM. (n = 5).

Table 7: Effect of MOESE on serum electrolytes in rats in the reversibility study

Dose (mg/kg)	Na (mmol/L)	K (mmol/L)	Cl ⁻ (mmol/L)	HCO ₃ ⁻ (mmol/L)	Ca (mmol/L)
0	135.00± 0.58	6.03± 0.83	98.67± 1.86	17.33± 0.33	2.68± 0.04
50	135.33± 1.20	6.97± 0.57	97.33± 0.88	18.67± 0.67	2.59± 0.09
200	135.00± 1.53	7.47± 0.30	89.67± 1.45 ^{ab}	22.00± 0.58 ^{ab}	2.74± 0.05
800	136.00± 1.73	7.10± 0.84	95.33± 1.76 ^c	20.00± 0.58 ^{ac}	2.67± 0.06

Values are mean ± SEM. (n = 5).

Table 8: Effect of MOESE serum lipid profiles of rats in the main study

Dose (mg/kg)	Trig (mmol/L)	Total chol (mmol/L)	LDL (mmol/L)	HDL (mmol/L)
0	1.13 ± 0.07	3.97 ± 0.03	1.01 ± 0.07	2.60 ± 0.15
50	1.17 ± 0.03	4.00 ± 0.10	0.96 ± 0.05	2.73 ± 0.15
200	1.20 ± 0.11	4.23 ± 0.09 ^{ab}	0.94 ± 0.12	3.17 ± 0.09 ^a
800	1.17 ± 0.09	3.73 ± 0.03 ^{abc}	1.03 ± 0.04	2.60 ± 0.09 ^c

Values are mean ± SEM. (n = 5).

Table 9: Effect of MOESE on serum lipid profiles of rats in the reversibility study

Dose (mg/kg)	Trig (mmol/L)	Total chol (mmol/L)	LDL (mmol/L)	HDL (mmol/L)
0	0.61 ± 0.03	4.63 ± 0.32	2.50 ± 0.25	2.50 ± 0.25
50	0.68 ± 0.12	4.43 ± 0.07	2.87 ± 0.03	2.87 ± 0.03
200	0.80 ± 0.02	4.43 ± 0.15	2.77 ± 0.15	2.77 ± 0.15
800	0.71 ± 0.10	4.40 ± 0.10	2.17 ± 0.27	2.17 ± 0.27

Values are mean ± SEM. (n = 5).

Table 10: Effect of MOESE on antioxidants and MDA levels in serum (90 day study)

Dose (mg/kg)	SOD (μl/ml)	GPX (μl/L)	MDA (μmol/L)
0	208.33±0.29	2399.70±45.11	3.07±0.07
50	277.67±5.55 ^a	3025.30±43.56 ^a	2.43±0.15 ^a
200	229.33±4.84 ^b	2561.00±21.03 ^{ab}	2.13±0.15 ^a
800	210.00±7.64 ^b	3248.00±44.00 ^{abc}	2.30±0.30 ^a

Values are mean ± SEM (n=5).

Table 11: Effect of MOESE on antioxidants and MDA level in serum (30 day reversibility study)

Dose (mg/kg)	SOD (ul/ml)	GPX (ul/L)	MDA (umol/L)
0	204.33±5.81	2699.30±186.2	3.40±0.23
50	277.33±4.40 ^a	3083.00±19.76	1.97±0.03 ^a
200	309.00±3.06 ^{ab}	3407.30±196.36 ^a	2.03±0.03 ^a
800	256.00±8.00 ^{abc}	3186.00± 282.00	2.20±0.50 ^a

Table 12: Effect of MOESE on hematological parameters in blood (90 day study)

Dose (mg/kg)	PCV (%)	WBC (10 ⁹ /L)	N (%)	L (%)	RBC (10 ¹² /L)	Hb (g/dl)	PLT (10 ⁹ /L)	MCV (fl)	MCH (pg)	MCHC (g/dl)
0	36.67 ±0.33	5.51 ±0.47	69.00 ±0.57	30.33 ±0.33	6.26 ±0.06	15.77 ±0.22	255.00 ±24.70	59.00 ±0.00	26.43 ±0.13	43.93 ±0.68
50	36.67 ±0.33	6.87 ±0.79	69.67 ±0.33	30.00 ±0.33	6.27 ±0.11	15.83 ±0.37	359.67 ±25.34	56.33 ±0.88	25.53 ±0.18	44.73 ±1.14
200	35.00 ±1.15	4.95 ±0.38	69.67 ±0.33	30.00 ±0.00	6.24 ±0.08	17.20 ±0.17	312.00 ±50.14	55.33 ±0.33*	27.40 ±0.35	45.53 ±1.59
800	33.00 ±3.00	7.28 ±1.13	68.33 ±1.86	33.50 ±0.50	6.55 ±0.18	16.20 ±1.10	312.50 ±30.50	55.00 ±1.00*	27.00 ±0.20	48.95 ±0.65

Values are expressed as mean ± S.E.M. (n = 5).

Table 13: Effect of MOESE on some hematological parameters in blood (30 day reversibility study)

Dose (mg/kg)	PCV (%)	WBC (10 ⁹ /L)	N (%)	L (%)	RBC (10 ¹² /L)	Hb (g/dl)	PLT (10 ⁹ /L)	MCV (fl)	MCH(pg)	MCHC (g/dl)
0	45.00 ±0.58	10.90 ±1.39	68.66 ±0.67	31.33 ±0.67	8.59 ±0.06	15.77 ±0.33	412.67 ±35.41	63.33 ±1.45	22.37 ±0.34	36.27 ±0.74
50	43.67 ±1.33	10.63 ±1.78	68.33 ±1.20	30.67 ±0.33	6.86 ±0.18	15.80 ±0.71	385.67 ±36.73	63.67 ±0.66	22.97 ±0.48	36.07 ±0.64
200	45.00 ±1.53	6.10 ±1.15	85.33 ±0.33*	35.33 ±0.33*	4.97 ±0.09*	15.33 ±0.79	404.33 ±31.15	64.67 ±1.33	21.20 ±0.49	30.33 ±0.23
800	38.50 ±0.50	5.99 ±0.29	65.50 ±0.50	34.50 ±0.50*	5.99 ±0.41	11.55 ±0.45	377.50 ±20.50	64.50 ±3.50	23.10 ±1.50	38.75 ±3.35

Values are expressed as mean ± S.E.M. (n = 5).

Table 14: Effect of MOESE on sperm motility, count, morphology and pH (90 day study)

Dose (mg/kg)	Sperm motility (%)	Sperm count (millions/ml)	Abnormality (%)	pH
0	75.33±7.75	39.67±0.67	7.20±1.72	4.70±0.20
50	66.67±6.67	42.33±0.88	8.33±2.01	4.20±0.06*
200	75.00±0.00	36.00±1.15	7.40±1.50	4.17±0.03*
800	57.50±2.50	41.00±6.00	5.50±1.71	4.25±0.05*

Values are expressed as mean ± S.E.M. (n = 5). $p \leq 0.05$ vs control (One-way ANOVA followed by Dunnet posttest).

Table 15: Effect of MOESE on sperm motility, count, morphology and pH (30 day reversibility study)

Dose (mg/kg)	Sperm motility (%)	Sperm count (millions/ml)	Abnormality (%)	pH
0	80.00±7.63	53.33±4.67	2.67±1.67	4.23±0.12
50	80.00±2.89	63.33±6.57	3.00±1.67	4.53±0.29
200	75.00±5.00	51.33±6.22	2.90±1.67	4.50±0.25
800	70.00±10.0	48.50±0.50	2.80±2.50	4.30±0.20

Values are expressed as mean ± S.E.M. (n = 5). $p \leq 0.05$ vs control (One-way ANOVA followed by Dunnet posttest).

of 50mg/kg caused statistically significantly increase ($p < 0.05$) in body weight on day 35, compared to control while a statistically significant reduction ($p < 0.05$) in body weight at dose of 800mg/kg on day 49 were observed, compared to 50mg/kg. However, in the female rats, no statistically significant differences in body weight were observed at all doses.

The relative organ weights of the rats are shown in Table 1. At doses 50, 200, and 800 mg/kg, there were statistically significant reduction ($p < 0.05$) in the relative organ weights of the liver, lungs and spleen, compared to control. There was also statistically significant reduction ($p < 0.05$) in weight of testes at doses of 200 and 800 mg/kg, compared to control and 50mg/kg groups, while the relative weight of the heart, at the dose of 200 mg/kg, was statistically significantly reduced ($p < 0.05$), compared to control. There was a statistically significant increase ($p < 0.05$) in the relative weights of pancreas and brain at the dose of 200 mg/kg compared to control respectively. When compared to 50 mg/kg, there was a statistically

significant reduction ($p < 0.05$) in the relative weight of liver (at dose of 200 mg/kg), lungs and testes (at the doses of 200 and 800 mg/kg), while a statistically significant increase ($p < 0.05$) in the weights of liver (at the dose of 800 mg/kg) and pancreas (at the dose of 200 mg/kg) were also observed when compared to 50mg/kg.

When compared with 200 mg/kg, there was a statistically significant increase ($p < 0.05$) in weights of liver and heart, and significant reduction ($p < 0.05$) in the weights of pancreas and brain, at the dose of 800 mg/kg respectively. The significant differences observed were reversed after 30 days of cessation of treatment (Table 2).

Effect of MOESE on Food and Water Intake

Food consumption and water intake of rats treated with MOESE doses (50, 200 and 800) for 90 days are presented in Figures 3 and 4 respectively. In respect of food intake, compared to control, MOESE produced significant reduction ($p < 0.05$) in average

daily food intake at dose of 50 mg/kg on days 20, 30, 40, and 70. The same trend of effect (significant reduction) was obtained ($p < 0.05$) at doses of 200 mg/kg and 800 mg/kg but throughout the treatment period. Compared to 50 mg/kg treatment group, there was significant reduction ($p < 0.05$) in average daily food intake at doses of 200 mg/kg and 800 mg/kg all through the treatment period except on days 80 and 90 when there was no significant difference ($p > 0.05$) when 200 mg/kg was compared to 50 mg/kg. Compared to 200 mg/kg, dose of 800 mg/kg produced significant decrease ($p < 0.05$) in average daily food intake on days 10, 60 and 80.

Concerning water intake, compared to control, MOESE at the dose of 50 mg/kg produced significant reduction ($p < 0.05$) in average daily water intake on days 10, 20, 30, 40, 50, and 90. Also, there was significant reduction at doses of 200 mg/kg and 800 mg/kg throughout the treatment period (days 10, 20, 30, 40, 50, 60, 70, 80 and 90).

EFFECT OF MOESE ON BIOCHEMICAL PARAMETERS

Effect of MOESE on Liver Function Parameters

There was significant increase ($p < 0.05$) in the activity of aspartate aminotransferase (AST) in the groups treated with 200 mg/kg (356.33 ± 22.66 U/L) and 800 mg/kg (330 ± 2.89 U/L) when compared to control (234 ± 1.20 U/L) (Table 3). When compared to 50 mg/kg treatment group, there was significant increase ($p < 0.05$) in AST activity in the groups treated with 200 mg/kg and 800 mg/kg. There was also a significant increase ($p < 0.05$) in the activity of alkaline phosphatase (ALP) in the groups treated with 800 mg/kg (91.00 ± 0.58) when compared to control (84.67 ± 1.76). A similar trend of increase occurred when compared 800 mg/kg to 50 mg/kg (84.33 ± 0.88) and to 200 mg/kg (81.33 ± 1.33) treatment groups. The concentration of albumin was significantly increased ($p < 0.05$) in the group treated with *M. oleifera* seed at the dose of 800 mg/kg (21.67 ± 1.45) when compared to control (18.33 ± 0.33). The effects on AST and ALP were not reversed after 30 days of cessation of administration of the ethanol extract of *M. oleifera* seed because the significant increase observed after 90 days administration still persisted (Table 4). The effect on albumin was, however, reversed after 30 days of cessation of administration of the extract (Table 4).

Effect of MOESE on Kidney Function Parameters

There was a no significant difference ($p > 0.05$) in serum levels of these parameters at all treatment doses when compared to the control group (Table 5).

Effect of MOESE on Serum Electrolytes Concentrations

There was a significant increase ($p < 0.05$) in

concentration of potassium (K) in the group treated with 800mg/kg of the extract (7.30 ± 0.23 mmol/L) when compared to the control group (6.60 ± 0.15 mmol/L) (Table 6). There was significant reduction ($p < 0.05$) in calcium concentrations in the groups treated with 50 mg/kg and 200 mg/kg of the extract when compared to the control. The effects on potassium and calcium were reversed after 30 days of cessation of the extract administration, while chloride concentration was significantly reduced in 200 mg/kg treatment group and bicarbonate was significantly increased in 200 mg/kg and 800 mg/kg groups (Table 7).

Effect of MOESE on Lipid Profiles

There was a significant increase ($p < 0.05$) in the concentration of total cholesterol in the group treated with the extract at the dose of 200 mg/kg (4.23 ± 0.09 mmol/L) when compared to the control group (3.97 ± 0.03 mmol/L); the increment ($p < 0.05$) is also significant when compared to 50 mg/kg treatment group (4.00 ± 0.10 mmol/L) (Table 8). A significant reduction ($p < 0.05$) in concentration of total cholesterol was obtained in the group treated with 800 mg/kg (3.73 ± 0.03 mmol/L) when compared to the control group (3.97 ± 0.03 mmol/L) and to the 50 mg/kg (4.00 ± 0.10 mmol/L) and 200 mg/kg (4.23 ± 0.09 mmol/L) treatment groups (Table 8). There was also a significant increase ($p < 0.05$) in the concentration of HDL in the groups treated with 200 mg/kg (3.17 ± 0.09 mmol/L) of the extract when compared to the control group (2.60 ± 0.15 mmol/L). At the dose of 800 mg/kg, there was a significant decrease ($p < 0.05$) in HDL concentration when compared to 200 mg/kg but not significantly different from the control group (Table 8). The effects on total cholesterol and HDL were reversed after 30 days of cessation of administration of the extract (Table 9).

Effect of MOESE on Serum Antioxidants and Malondialdehyde Levels

At doses of 200mg/kg and 800mg/kg, there was no significant difference in the level of superoxide dismutase (SOD) in serum. However, a significant increase ($p < 0.05$) in the level of glutathione peroxidase (GPX) was observed with 200mg/kg dose of MOESE (2561.00 ± 21.03 ul/L vs control value of 2399.70 ± 45.11 ul/L) (Table 10). Also, there was a significant increase ($p < 0.05$) in GPX with the 800mg/kg dose of MOESE (3248.00 ± 44.00 vs control value of 2399.70 ± 45.71) (Table 10). Also, there was a significant decrease ($p < 0.05$) in the level of SOD in the group that received 200mg/kg dose of MOESE (229.33 ± 4.84 ul/ml) compared to the 50mg/kg dose of MOESE (277.67 ± 5.55 ul/ml) (Table 10). A significant decrease ($p < 0.05$) in the level of SOD in the group that received 800mg/kg dose of MOESE (210.00 ± 7.64 ul/ml) when compared to the group that received

50mg/kg dose of MOESE (277.67 ± 5.55 ul/ml) was also recorded (Table 10).

At the dose of 50mg/kg, there was a significant increase ($p < 0.05$) in the level of SOD (277.67 ± 5.55 vs control value of 208.33 ± 9.28 ul/ml), as well as a significant increase ($p < 0.05$) in the level of glutathione peroxidase (GPX), (3025.30 ± 43.56 ul/L vs control value of 2399.70 ± 45.71 ul/L) (Table 10). Also, there was a significant decrease ($p < 0.05$) in the level of GPX in the group that received 200mg/kg dose of MOESE (2561.00 ± 21.03 ul/L) when compared to the group that received 50mg/kg dose of MOESE (3025.30 ± 43.56 ul/L) (Table 10). There was a significant increase ($p < 0.05$) in the level of GPX in the group that received 800mg/kg dose of MOESE (3248.00 ± 44.00 ul/L) when compared to the group that received 50mg/kg dose of MOESE (3025.30 ± 43.56 ul/L) (Table 10). There was also a significant increase ($p < 0.05$) in the level of GPX in the group that received 800mg/kg dose of MOESE (3248.00 ± 44.00 ul/L) when compared to the group that received 200mg/kg dose of MOESE (2561.00 ± 21.03 ul/L) (Table 10).

There were significant decreases in the level of MDA across the treatment group after the 90 day period (Table 10). At the dose of 50mg/kg, MOESE caused a significant decrease ($p < 0.05$) in the level of MDA (2.43 ± 0.15 vs control value of 3.07 ± 0.07 umol/L) (Table 10). There was a significant decrease ($p < 0.05$) in the level of MDA in the group treated with MOESE at the dose of 200mg/kg (2.13 ± 0.15 vs 3.07 ± 0.07 umol/L) compared with the distilled water treated group (Table 10). A significant decrease ($p < 0.05$) in the level of MDA was also observed in the group treated with MOESE at the dose of 800mg/kg (2.30 ± 0.30 vs control value of 3.07 ± 0.07 umol/L) (Table 10).

After a 30 day cessation of treatment, there were significant increases in the level of superoxide dismutase (SOD) enzyme in the serum across the treatment groups (Table 11); this suggests that the increase in free radical generation mediated by MOESE were retained even with cessation of therapy. At the dose of 50mg/kg, there was a significant increase ($p < 0.05$) in the level of SOD (277.33 ± 4.40 vs 204.33 ± 5.81 ul/ml in control) (Table 11), at 200mg/kg, there was also a significant increase ($p < 0.05$) in the level of SOD (309.00 ± 3.06 vs 204.33 ± 5.81 ul/ml in control) (Table 11), and at 800mg/kg, a significant increase ($p < 0.05$) in the level of SOD (256.00 ± 8.00 vs 204.33 ± 5.81 ul/ml in control group) was also recorded (Table 11). There was a significant increase ($p < 0.05$) in the level of SOD in the group that earlier received 200mg/kg dose of MOESE (309.00 ± 3.06 ul/ml) when compared with the group that was previously treated with 50mg/kg dose of MOESE (277.33 ± 4.40 ul/ml) (Table 11). There was a significant decrease ($p < 0.05$) in the level of SOD in the group that previously

received 800mg/kg dose of MOESE (256.00 ± 8.00 ul/ml) when compared with the 50mg/kg dose of MOESE previously treated animals (277.33 ± 4.40 ul/ml) (Table 11). A significant decrease ($p < 0.05$) in the level of SOD was also recorded in the group that received 800mg/kg dose of MOESE (256.00 ± 8.00 ul/ml) when compared with the group that received 200mg/kg dose of MOESE (309.00 ± 3.06 ul/ml) (Table 11). The group treated with 200mg/kg dose of MOESE showed a significant increase ($p < 0.05$) in the level of GPX (3407.30 ± 196.36 vs 2699.30 ± 186.2 ul/L) when compared with the group treated with distilled water (Table 11). There were significant decreases in the level of MDA across the treated group after the 30 day cessation of therapy (Table 11). The group initially treated with MOESE at the dose of 50mg/kg showed a significant decrease ($p < 0.05$) in the level of MDA (1.97 ± 0.03 vs 3.40 ± 0.23 umol/L) when compared with the control group (Table 11). There was also a significant decrease ($p < 0.05$) in MDA level in the group that initially received 200mg/kg dose of MOESE (2.03 ± 0.03 vs control value of 3.40 ± 0.23 umol/L) (Table 11). A significant decrease ($p < 0.05$) in the level of MDA was also observed in the group that previously received 800mg/kg dose of MOESE (2.20 ± 0.50 vs control value of 3.40 ± 0.23 umol/L) after the 30 day cessation of therapy (Table 11).

Effect of MOESE on Haematological Parameters in Blood

MOESE did not produce any significant effect ($P > 0.05$) on haematological parameters after the 90 day administration except for MCV in which there was a significant decrease ($p < 0.05$) in the group treated with MOESE at the dose of 200mg/kg (55.33 ± 0.33 10^9 /L) when compared with the group treated with distilled water (59.00 ± 0.00 10^9 /L) (Table 12), and also a significant decrease ($p < 0.05$) in the group treated with 800mg/kg *M. oleifera* (55.00 ± 1.00 vs control value of 59.00 ± 0.00 10^9 /L) (Table 12).

After the 30 day cessation of treatment, a significant increase ($p < 0.05$) was recorded in the level of neutrophils in the group earlier treated with 200mg/kg dose of MOESE ($85.33 \pm 0.33\%$) when compared with the distilled water treated group (68.66 ± 0.67) (Table 13). Also, a significant increase ($p < 0.05$) in the level of lymphocytes in the group earlier treated with 200mg/kg dose of MOESE (35.33 ± 0.33 vs $31.33 \pm 0.67\%$ in control group) was recorded (Table 13). A significant increase ($p < 0.05$) in the level of lymphocytes was also recorded in the group that earlier received 800mg/kg dose of MOESE (34.50 ± 0.50 vs control value of $31.33 \pm 0.67\%$) (Table 13). For RBC, a significant decrease ($p < 0.05$) in the group earlier treated with 200mg/kg dose of MOESE (4.97 ± 0.09 10^{12} /L) compared with control value of (8.59 ± 0.06 10^{12} /L), was also observed (Table 13).

EFFECT OF MOESE ON SPERM MOTILITY, COUNT, MORPHOLOGY AND pH

MOESE did not produce any significant effect on sperm motility, count and abnormality after the 90 day administration period. However, there was significant decrease in pH across all the treated groups compared to control animals (Table 14). At the dose of 50mg/kg of MOESE, there was a significant decrease ($p < 0.05$) in pH (4.20 ± 0.06 vs control value of 4.70 ± 0.20) (Table 14). A significant decrease ($p < 0.05$) in pH was also observed in the group treated with 200mg/kg dose of MOESE (4.17 ± 0.03) when compared with the distilled water treated group (4.7 ± 0.20) (Table 14). It was also observed that the 800mg/kg dose of MOESE treated group showed a significant decrease ($p < 0.05$) in pH (4.25 ± 0.05) when compared with the distilled water treated group (Table 14).

After the 30 day cessation of therapy, no significant difference in sperm parameters was observed (Table 15).

Effect of *M. oleifera* seed ethanolic extract on histological presentations

Concerning the liver, there was no adverse histopathological presentations observed in the control group (Fig. 5A). The liver appeared normal with preserved hepatic architecture, hepatocytes with normal histological features and intact stroma. The liver of rats that received 50 mg/kg presented with dilated blood vessels, areas of marked necrosis and hyperchromatic foci (Fig. 5B), while that of 200 mg/kg showed dilated blood vessels, sinusoidal haemorrhage and extensive areas of necrosis (Fig. 5C). Dilated blood vessels and extensive areas of necrosis were also observed in the liver at the doses of 800 mg/kg (Fig. 5D).

Discussion

The reticence to the widespread use of medicinal plants is gradually being eroded by the inability of orthodox drugs to cure long standing and common ailments such as diabetes and hypertension. Additionally, anecdotal evidence of efficacy of medicinal plants has boosted confidence in the use of such products. In the present study, the 96h LD₅₀ value of *M. oleifera* seed extract for the rats was found to be 2900mg/kg which indicates that *M. oleifera* seed extract could be relatively not toxic to rats at this concentration based on chemical labeling and clarification of acute systemic toxicity on oral LD50 values recommended by the Organization for Economic Cooperation and Development (OECD).³¹ However, it has been reported that the LD50 is not an absolute value but an inherently variable biologic parameter that cannot be compared to constants sure as

molecular weight or melting point.³² Organ weight changes can be sensitive indicators of target organ toxicity, and significant changes in organ weights may occur in the absence changes in other pathology parameters.³³ In this study, there were no body weight, body weight gain, food consumption, absolute or relative organ weight, or water consumption or clinical changes associated with the administration of MOSES. Any body weight and food and water consumption changes were overall small magnitude, within the range of historical control (Table 1&2, Fig 1, 2&3). Liver function tests help in the diagnosis of any abnormal/normal condition of liver. Leakage of cellular enzymes into plasma indicates the sign of hepatic tissue damage.^{34,35} Generally measurement of alanine aminotransferase (ALT) and AST are used as important diagnostic marker to indicate liver injury due to hepatotoxins. In this study, administration of MOSES extract significantly ($p < 0.05$) increase serum AST, ALP and albumin levels but did not changed ALT values in treated animals relative to control (Table 3 & 4). The histology results also shows the damage of parenchymal and mitochondrial sites of the liver where ALT is located. Our results is dissimilar to that of Ferreira et al (2009)³⁶ who reported no alterations in hepatic enzymes in rat treated with 1300-1670mg/kg/day *Moringa Oleifera* seed for 30days, but agrees with Bharani et al. (2003)³⁷ who reported that administration of the hydroalcoholic extract of *M. oleifera* drumsticks by oral route elevated levels of some hepatic enzymes involved in detoxification of xenobiotic substances, such as carcinogens and plant venomous compounds. The increased serum albumin level suggests a potential for the seed to cause imbalance fluid distribution. Albumin plays a major role in stabilizing extracellular fluid volume by contributing to oncotic pressure of plasma. Because smaller animals (for example rats) function at a lower blood pressure, they need less oncotic pressure to balance this, and thus need fewer albumins to maintain proper fluid distribution.³⁸ The increment in AST and ALT persisted while that of albumin was reversed after 30 days of cessation of the extract.

Reactive oxygen species (ROS) are related to oxidative stress and many scientific reports have shown that excessive production of ROS can further aggravate oxidative stress and have implicated ROS in a number of disorder/disease processes, including heart disease, diabetes, liver injury, cancer, and aging.³⁹⁻⁴¹ Equilibrium between ROS and enzymatic antioxidant enzymes including superoxide dismutase (SOD) and glutathione peroxidase (GPx) are crucial and could be an important mechanism for preventing damage by oxidative stress. The liver plays a central role in the maintenance of systemic lipid homeostasis and is especially susceptible to ROS damage, mechanism has been suggested to play role in preventing APAP toxicity.⁴² In

this study, MOSES has shown a significant increase of these enzymes (Tables 10 & 11) suggesting the presence of antioxidants compounds. These results are consistent with previous studies described by Gupta et al. (2005)⁴³ and his colleagues that shows the capacity of *moringa* seeds to protect animals against oxidant stress caused by arsenic exposure. Several researches attributed this oxidative protection of the seeds to the presence of compounds with antioxidant activity against free radicals.^{44,45}

No significant effect was produced by MOESE on hematologic parameters after the 90 day administration except a slight decrease in MCV in the group treated with MOESE at the dose of 200mg/kg and 800mg/kg when compared with the control group, the decrease in MCV was however reversed after the 30 day cessation of treatment. (Tables 12 & 13)

Regarding the semen analysis, significant differences were not observed in sperm count, motility and abnormality across the three treatment doses of MOESE used during the 90 day treatment period when compared with control animals. However, there was a significant decrease in the semen pH in all treated group when compared to control group (Table 14). The microenvironment of sperm, seminal plasma, is of great significance. Seminal plasma is a mixture of secretions from the testes, epididymides and accessory sex glands. Seminal plasma contains $\text{HCO}_3^-/\text{CO}_2$, inorganic ions, organic acids, sugars, lipids, steroids, amino acids, polyamines, nitrogenous bases and proteins.⁴⁶ As a result, semen has a very high buffering capacity, higher than that of most other body fluids. Therefore, the pH of the seminal fluid may play a significant role not only in maintaining the viability and quality of the sperm, but also in ensuring fertilization. Declined Na^+/K^+ -ATPase activity at acidic pHs has been reported to result in decreased sperm movement and capacitation, which could be one of the mechanisms of male infertility,⁴⁷ this study shows marked decrease in the pH of sperm in animals treated with MOSES when compared with control, suggesting that the extract at given doses may cause infertility in male rats. The decrease in pH was reversed after the 30 day cessation of treatment in all three treated groups. Histopathology of the liver from treated rats showed degenerative lesions on hepatic tissue. Some hepatotoxic drugs produce their effects through toxic metabolites and immunological reaction,⁴⁸ This result is buttressed by increased level of AST and ALP.

Our study clearly demonstrated that ethanol extract of *Moringa oleifera* seeds could cause infertility in male rats due to decreased semen pH. Our results also showed that the extract may be hepatotoxic due to persistent high level of AST and ALP even after cessation of exposure to the extract, this is also consistent with the histopathological results that shows

hepatic necrosis associated with chronic exposure to the extract.

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References

1. Kebede S, Afework M, Debella A, Ergete M, Makonnen E. Toxicological study of the butanol fractionated root extract of *Asparagus africanus* Lam., on some blood parameter and histopathology of liver and kidney in mice. *BMC Research Notes*. 2016; 9(49):1-15.
2. Himanshu M, Bhupendra KM, Dharam CJ. Optimization of extraction conditions and hptlc - uv method for determination of quinine in different extracts of *Cinchona species* bark. *Rec Nat Prod*. 2008; 2(4): 107-115.
3. Smith TW, Antman EM, Friedman PL, Blatt CM, Marsh JD. Digitalis glycosides: mechanisms and manifestations of toxicity. *Prog Cardiovasc Dis*. 1984; 26:413-458.
4. Adefolaju T. (2011). The dynamics and challenging structure of traditional healing system in Nigeria. *International Journal of Health Research*. 2011; 4(2):99-106.
5. Fahey H. *Moringa oleifera*: A Review of the Medical Evidence for Its Nutritional, Therapeutic, and Prophylactic Properties. Part 1. *TreesLife J*. 2005; 1:5.
6. Njan AA, Amali MO, Olatunji LO, Olorundare OE. An Overview of the Ethno- Pharmacological Potentials of *Moringa Oleifera* Lam, "The Miracle Tree". *Archives of Basic & Applied Medicine*. 2014; 2:135-145.
7. Aja PM, Ibiam UA, Nwali BU, Orji OU, Edwin N, Afiukwa CA. Evaluation of Effect of Ethanolic Extracts of *Moringa oleifera* and *Cajanus cajan* Leaves on Lipid Profiles in Alloxan Induced Diabetic Albino Rats. *Global Journal of Biotechnology & Biochemistry*. 2015; 10(2):71-76.
8. Gupta R, Mathur M, Bajaj VK, Katariya P, Yadav S, Kamal R, Gupta RS. Evaluation of antidiabetic and antioxidant activity of *Moringa oleifera* in experimental diabetes. *Journal of Diabetes*. 2012; 4:164-171.

9. Sharida Fakurazi, Syazana Akmal Sharifudin, Palanisamy Arulselvan. Moringa oleifera Hydroethanolic Extracts Effectively Alleviate Acetaminophen-Induced Hepatotoxicity in Experimental Rats through Their Antioxidant *Nature Molecules* 2012; 17:8335-8350.
10. Alikwe PCN, Ohimain EI, Zige DV, Angaye TNC (2013). Antibacterial activity of ethanol extract of the defatted seed and seed coat of Moringa oleifera. *IOSR Journal of Pharmacy and Biological Sciences* 2013; 8(1):38-41.
11. Kansara SS, Singhal M. Evaluation of Antiulcer Activity of Moringa Oleifera Seed Extract. *Journal of Pharmaceutical Science and Bioscientific Research* 2013; 3(1):20-25.
12. Minaian M, Asghari G, Taheri D, Saeidi M, Nasr-Esfahani S. Anti-inflammatory effect of Moringa oleifera Lam. seeds on acetic acid-induced acute colitis in rats. *Avicenna Journal of Phytomedicine*. 2014; 4(2):127-136.
13. Atsukwei D, Eze ED, Moses DM, Adinoyi SS, Upkabi CN. Hypolipidaemic effect of ethanol leaf extract of Moringa Oleifera Lam. in experimentally induced hypercholesterolemic wistar rats. *Int. J. Nutri. And Food Sci*. 2014; 3(4):355-360.
14. Ajibade TO, Arowolo R, Olayemi FO. Phytochemical screening and toxicity studies on the methanol extract of the seeds of Moringa oleifera. *J. Complement Integr. Med.* 2013; 10:11-16.
15. Sana A, Saleem R, Faizi S. Hypotensive Activity of Moringa oleifera Lam (Moringaceae) Root Extracts and its Volatile Constituents. *Tropical Journal of Pharmaceutical Research*. 2015; 14(5):823-830.
16. Harbone JB. Phytochemical Methods London. Chapman and Hall Ltd. 1973; 49-188.
17. Bargah RK. Preliminary test of phytochemical screening of crude ethanolic and aqueous extract of Moringa pterygosperma Gaertn. *Journal of Pharmacognosy and Phytochemistry*. 2015; 4(1):07-09
18. Guide for the Care and Use of Laboratory Animals. Revised. NIH publication. 1978; No. 83-23. National Institute of Health Bethesda. MD.
19. Lorke D. (1983). A new approach to practical acute toxicity testing. *Arch. Toxicol.* 1983; 54(4):275-278
20. Afolabi SO, Akindele AJ, Awodele O, Anunobi CC, Adeyemi OO. A 90 day chronic toxicity study of Nigerian herbal preparation DAS-77 in rats. *BMC Complementary and Alternative Medicine* 2012; 12:79.
21. Gornall AC, Bardawill CJ, David MM. Determination of serum protein by means of biuret reaction. *J Biol Chem*. 1949; 177(2):751-756.
22. Plummer DT. An introduction to practical biochemistry. McGraw-Hill. 1978; 119-154.
23. Baginsky ES, Marie SS, Clark WL, Zak B. Direct microdetermination of calcium. *Clinica Chimica Acta*. 1973; 46:49-54.
24. Cheesbrough M. District Laboratory Practice in Tropical Countries, Part 1. UK: Cambridge University Press. 2005; 365-370.
25. Ikewuchi JC, Onyeike EN, Uwakwe AA, Ikewuchi CC. Effect of aqueous extract of the leaves of Acalypha wilkesiana 'Godseffiana' Muell Arg (Euphorbiaceae) on the hematology, plasma biochemistry and ocular indices of oxidative stress in alloxan induced diabetic rats. *J Ethnopharmacol* 2011; 137:1415-1424.
26. Soon YY, Tan BKH. Evaluation of the hypoglycemic and antioxidant activities of Morinda officinalis in streptozocin-induced diabetic rats. *Singapore Med J*. 2002; 43:077-085.
27. Cheesbrough M. Examination of semen. In District laboratory practice in tropical countries (Part 2). UK: Cambridge University Press. 2000; 130-132
28. Ogli SA, Enyikwola O, Odeh SO. Evaluation of the efficacy of separate oral supplements compared with the combined oral supplements of vitamins C and E on sperm motility in Wistar rats. *Niger J Physiol Sci* 2009; 24:129-135.
29. Krause WJ. The art of examining and interpreting histologic preparations. A student handbook. UK: Parthenon Publishing Group. 2001; 9-10.
30. Mahajan BK. Significance of Difference in Means. In: Mahajan BK, editor. Methods in Biostatistics for Medical and Research Workers. JAYPEE Brothers Medical Publishers. 1997; 130-55.
31. Walum, E. Acute oral toxicity. *Environ. Health Perspect*. 1998; 106:497-502.
32. Oliver JA. Opportunity for using fewer animals in acute toxicity studies. In: *Chemicals Testing and Animal Welfare*. The National Chemicals Inspectorate, Solana, Sweden. 1986; 119-143.
33. Bailey SA, Zidell RH, Perry RW. Relationship between organ weight and body weight/brain weight in the rat: what is the best analytical endpoint? *Toxicol. Pathol.*, 2004; 32:448.
34. Ramaiah SK. A toxicologist guide to the diagnostic interpretation of hepatic biochemical parameters. *Food Chem. Toxicol.* 2007; 45:1551-1557.
35. Sreelatha S, Padma PR, Umadevi M. Protective effects of Coriandrum sativum extracts on carbon tetrachloride-induced

- hepatotoxicity in rats. *Food Chem. Toxicol.* 2009; 47 : 702–708.
36. Ferreira PMP, Carvalho AFU, Farias DF, Cariolano NG, Melo VMN, Quiroz MGR, Martins AMCM, Machado-Neto JC. Larvicidal activity of the water extract of moringa oleifera seeds against Aedes aegypti and its toxicity upon laboratory animals. *An Acad. Bras. Ciencias.* 2009; 81(2):207-216.
37. Bharali R, Tabassum J, and Azad M.R. Chemomodulatory effect of Moringa oleifera Lam. on hepatic carcinogen metabolizing enzymes, antioxidant parameters and skin papillomagenesis in mice. *Asian Pac J Cancer Prev* 2003; 4 :131-139.
38. Harper ME, Dugaiczky A. *Am. J. Hum. Genet.* 1983; 35(4):565–572.
39. Sies H, Stahl W, Sevanian A. Nutritional, dietary and postprandial oxidative stress. *J. Nutr.* 2005; 135:969–972.
40. Giordano FJ. Oxygen, oxidative stress, hypoxia, and heart failure. *J. Clin. Invest.*, 2005; 115:500–508.
41. Klaunig JE, Kamendulis LM. The role of oxidative stress in carcinogenesis. *Annu. Rev. Pharmacol. Toxicol.* 2004; 44:239–267.
42. Jaeschke H, Knight TR, Bajt ML. The role of oxidant stress and reactive nitrogen species in acetaminophen hepatotoxicity. *Toxicol. Lett.* 2003; 144:279–288.
43. Gupta R, Kannan GM, Sharma M and Flora SJS. Therapeutic effects of *Moringa oleifera* on arsenic induced toxicity in rats. *Environ Toxicol Pharmacol.* 2005; 20:456- 464.
44. Geervani P and Devi A. Influence of protein and fat on utilization of carotene from drumstick (*Moringa oleifera*) leaves. *Indian J Med Res.* 1981; 74:548-553.
45. Siddhuraju P and Becker K. Antioxidant properties of various solvent extracts of total phenolic constituents from three different agroclimatic origins of drumsticks tree (*Moringa oleifera* Lam.) leaves. *J Agric Food Chem.* 2003; 51:44-55.
46. Wolters-Everhardt E, Dony JM, Lemmens WA, Doesburg WH, De Pont JJ. Buffering capacity of human semen. *Fertil Steril.* 1986; 46:114–9.
47. Zhou J, Chen L, Li J, Li H, Hong Z, Xie M, et al. The Semen pH Affects Sperm Motility and Capacitation. *PLoS ONE* 2015; 10(7)
48. Krishna KL, Mruthunjaya K, Patel JA. Antioxidant and hepatoprotective activity of leaf extract of *Justicia gendarussa* burm. *Int. J. Biol. Chem.*, 2009; 3:99-110.

Pap Screening as Preventive Tool Against Cervical Cancer: A Report of Carcinoma in-situ In A Woman With Family History of Cancer in Ilorin

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Abstract

The incidence of cervical cancer in the developed countries has significantly reduced as a result of well-organized and coordinated Pap screening program, which is aimed at detection of pre-invasive lesions that are then promptly treated. We report a 45-year old woman whose immediate elder sister had breast carcinoma, and she presented for routine breast and cervical cancer screening. Pap smears on 2 occasions revealed a high grade squamous intraepithelial lesion (HSIL). Histopathological evaluation of the cervix after hysterectomy revealed carcinoma in-situ. We discussed the need for early screening for malignancies in persons with significant family history of cancer.

Keywords: Pap smear, Cervical cancer, Ilorin

Introduction

Cervical cancer is the second most commonly diagnosed cancer in the female after breast cancer. It is the commonest gynecologic cancer with a global burden of 528,000 new cases and 266,000 deaths every year.¹ Cervical cancer is preceded for several years by curable precancerous lesions, and application of Papanicolaou smear screening has significantly reduced the incidence and expected deaths from cervical cancer in United States.² Screening for pre-invasive lesions in the uterine cervix is low in most developing countries and cervical cancer is still the most common and leading cause of death among women in their most productive years.³ In Ilorin, invasive cervical cancer accounted for 63.1% of all gynecological cancer and presentation was usually advanced.⁴

The practice of routine screening for pre-invasive lesions of the cervix through pap smear is low (3%) despite high level of awareness of pap smear and cervical carcinoma even among health workers in Ilorin Metropolis.⁵

The frequently asked question about cancer generally is: my dad, mum, or sibling had cancer, am I going to develop it too? Fortunately, genetic predisposition to cancer is rare and the proportion of cancers that are directly attributed to inherited genes in a population is small.⁶ It is estimated that about 1% of all cancers are truly inherited while another 5-10% of common cancers that occur in small familial clusters are likely to have a genetic predisposition.⁶

Also, many inherited cancers occur in the absence of an obvious family history. Examples are strong cancer-predisposing genes, such as adenomatous polyposis coli (APC) gene that arise as new germline mutation or deletion during gametogenesis without any family history.⁶ The list of inherited cancer syndromes is long and beyond the scope of this review. However, few examples with strong predisposition to a variety of malignancies include familial polyposis coli, hereditary non-polyposis colorectal cancer syndrome, familial retinoblastoma, Li-Fraumeni syndrome, and Peutz-Jeghers syndrome.

It is important to suspect genetic predisposition to cancer when there are cancers in two or more young first-degree relatives, bilateral cancers in one individual or male breast cancer.^{7,8}

Case presentation

Mrs. A. A. is a 45 year old para 3+0 (all alive) woman who presented in a private hospital in Ilorin, Nigeria, for breast and cervical screening. She submitted herself for screening because her sibling, immediate elder sister, had mastectomy for right breast carcinoma. She is a product of polygamous family, 8th of the father and 2nd of her mother. The mother died at a young age of 35 years of an illness related to bleeding per vagina and fever. The cause of her mother's death could not be ascertained. There was no history of cancer or diseases associated with severe weight loss in any of the half-sisters, half-brothers, and their mothers.

She attained menarche at the age of 14 years and has been having regular menstrual flow since then. Her first coitus was at age 20 and had her first child at age 28 years. She breastfed all her babies for a period of 18 to 24 months. She admitted use of depo provera as contraceptive up until 17 years before presentation. She does not drink alcohol or smoke cigarette. She is the only wife of her husband who is a 50 year old professional. Both however denied history of multiple

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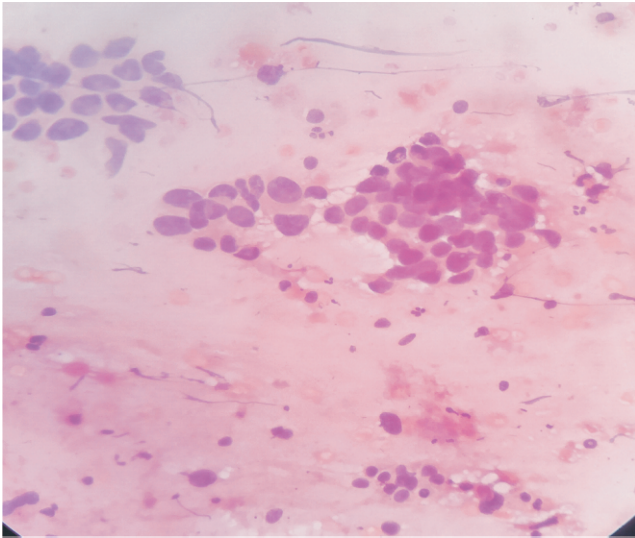


Fig 1. Pap smear with features of high grade squamous epithelial lesion (Papanicolaou stain x400)

sexual partners.

There was no lump palpable on clinical breast examination by the gynecologist at the private hospital. Also, there was no visible lesion in the cervix on speculum vaginal examination. Two pap smears were taken from the squamo-columnar junction and sent for cytology. The report of the pap smears showed high grade squamous epithelial lesion (HSIL) {fig 1}. A repeat pap smear 3 months later was also reported as HSIL. Patient accepted a simple hysterectomy because she had completed her family and also because of the fear of cancer since her mother died of illness related to uterine bleeding and her immediate elder sister had just been operated for breast cancer. Thorough sampling of the cervix revealed a carcinoma in-situ of the cervix {fig 2}.

Discussion

Cancer is a product of interaction between inherited genetic abnormalities and appropriate environmental factors, which include diets, infectious diseases, chemical, and physical agents. The study of genetic predisposition to cancer is important because the individuals (and their close family members) who inherit mutant genes are at very high risk of developing cancer and will benefit from screening and early treatment; and also because many inherited cancers have a non-heritable counterpart with a similar genetic pathway.^{9,10}

Screening for cancer, especially cervical cancer, has led to the significant reduction in the incidence of and mortality resulting from this disease in developed countries. Screening for cervical carcinoma is a success story in US with 26,000 deaths reported annually up till 1941 before introduction of widespread pap screening, and now 3,670 expected deaths from cervical in 2007.²

Despite high awareness about cervical cancer

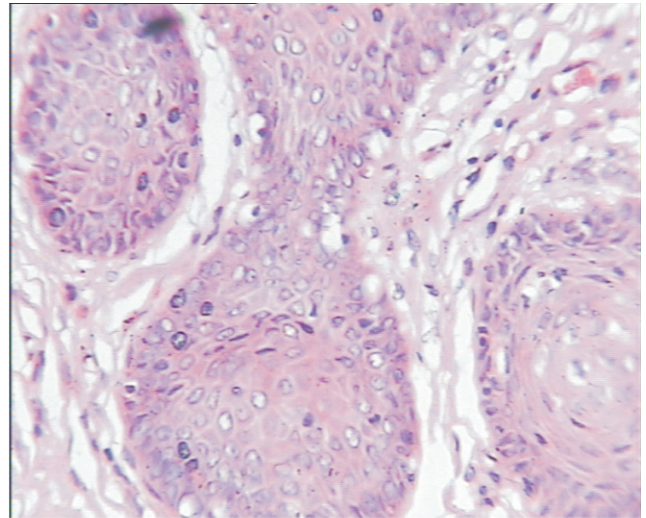


Fig. 2. Cervical biopsy shows nests of squamous cells with features of in-situ carcinoma. The basement is intact. (Hematoxylin & Eosin x400)

and pap screening reported by various authors in Nigeria, the practice has been abysmally low.^{5,11} Some of the reasons for this low practice include lack of organized screening program, cost of pap screening especially for low-income earners and unemployed, and lack of facility for treatment of pre-invasive cervical lesions detected by pap screening.

Our center being a tertiary health institution provides cytopathological services including gynecological cytology. Most of the patients that present for cervical screening in our center fall into two categories; one is voluntary routine screening by those who have heard about the role of pap smear in prevention of cervical cancer, and the second category belongs to those who are referred for screening as a result of gynecological complaints. Our case submitted herself for pap screening on account of fear of cervical cancer because her immediate elder sister was diagnosed of invasive breast carcinoma. However, due to lack of colposcopy in our center as at the time of the presentation and the fact the patient had completed her family; total hysterectomy was offered on account of high grade squamous intraepithelial lesion reported from Pap smear.

A careful histopathological examination of the cervix that revealed in-situ carcinoma confirmed the report of high grade squamous intraepithelial lesion from Pap smear and also justified total hysterectomy that was offered to this patient. While the elder sister of our case developed invasive breast carcinoma, this case would have developed invasive cervical carcinoma if left untreated.

Breast cancer, cervical carcinoma, and ovarian gonadoblastoma have been described in patients with Peutz-Jeghers syndrome.^{12, 13} This is an autosomal dominant inherited disorder that is characterized by hamartomatous polyps of the gastrointestinal tract, mucocutaneous melanin pigmentation and various

neoplasms. This syndrome is caused by truncating germline mutations in the *LKB1* gene (also called *STK11* gene), a serine threonine kinase tumor suppressor gene.¹⁴ While our case may be a sporadic cancer that is unrelated to another sporadic breast cancer in her sibling, a germ-line mutation involving a cancer predisposing gene, such is desirable to be excluded. This is to ensure that other first-degree relatives are undergoing screening, which should begin at early age against various screen-preventable cancers. In conclusion, Pap smear still remains an effective screening method for prevention of cervical cancer as observed in our case. However, lack of colposcopy, in most centers, to view and biopsy the lesion for histological confirmation, and lack of ablative therapy to treat screen-positive cases would discourage few women that come forward for Pap screening. There is need to raise awareness campaign on the benefits of Pap smear screening in the developing countries, including Nigeria. Also, reducing the burden of cervical cancer will require a properly organized population-based Pap screening program, treatment of screen-positive women and quality control measures to assess impact of the program. The personnel needed for effective and smooth running of the screening program also requires high quality training, continuous education and proficiency testing to achieve reliable result. First-degree relatives of cancer patients should be screened for various cancers at early age.

References

1. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C et al. GLOBOCAN 2012 v1.2, Cancer Incidence and Mortality Worldwide: IARC Cancer-Base No. 11 Lyon, France: International Agency for Research on Cancer; 2013. Available from: <http://globocan.iarc.fr>
2. Boring CC, Squires TS, Tong T. Cancer Statistics, 1994. *CA cancer J. Clin* 44: 7-26. 1993.
3. Koss LG: The Papanicolaou test for cervical cancer detection. A triumph and a tragedy. *JAMA* 261: 737-743. 1989.
4. Ijaiya MA, Aboyaji PA, Buhari MO. Cancer of the cervix in Ilorin, Nigeria. *West Afr J. Med* 23(4): 319-22. 2004.
5. Aboyaji PA, Ijaiya MA, Jimoh AAG. Knowledge, Attitude and Practice of cervical smear as a screening procedure for cervical cancer in Ilorin, Nigeria. *Trop J. Obstet Gynaecol* 21: 114-117. 2004.
6. Mohandas KM. Genetic predisposition to cancer. *Current Science* 81(5): 482-489. 2001.
7. Hall JM, Lee MK, Newman B, Morrow JE, Anderson LA, Huey B. Linkage of early-onset familial breast cancer to chromosome 17q21. *Science* 250 (4988): 1684-1689. 1990.
8. Couch FJ, Farid LM, DeShano ML, Tavtigian SV, Calzone K, Campeau L et al. BRCA2 germline mutations in male breast cancer cases and breast cancer families. *Nature Genetic* 13: 123-125. 1996.
9. Fearon ER, Vogelstein B. A genetic model for colorectal tumorigenesis. *Cell* 61 (5): 759-767. 1990.
10. Levy DB, Smith KJ, Beazer-Barclay Y, Hamilton SR, Vogelstein B, Kinzler KW. Inactivation of both APC Alleles in Human and mouse tumors. *Cancer Res* 54: 5953-5958. 1994.
11. Udigwe GO. Knowledge, attitude and practice of cervical cancer screening (pap smear) among female nurses in Nnewi, South Eastern Nigeria. *Niger J Clin Pract* 9(1): 40-43. 2006.
12. Tokatli F, Tuncbilek N, Puyan FO, Denizli B, Ibis K, Bayer G et al. Peutz-Jeghers syndrome combined with breast cancer, cervical carcinoma and ovarian gonadoblastoma: a case report. *J BUON* 9 (4): 469-472. 2004.
13. Kilic-Okman T, Yardim T, Gucer F, Altaner S, Yuce MA. Breast cancer, ovarian gonadoblastoma and cervical cancer in a patient with Peutz-Jeghers Syndrome. *Archives of Gynecology and Obstetrics* 278 (1): 75-77. 2008.
14. de Jong MM, Nolte IM, te Meerman GJ, van der Graaf WTA, Oosterwijk JC, Kleibeuker JH et al. Genes other than BRCA1 and BRCA2 involved in breast cancer susceptibility. *J Med Genet* 39: 225-242. 2002.

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