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Cost of Illness Analysis of Pelvic Inflammatory Disease in Nigeria a Developing Economy

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Abstract

Background: Pelvic inflammatory disease (PID) is a leading cause of infertility, ectopic pregnancies and psychological trauma, thus, representing a major public health concern and high economic burden for women in their reproductive ages.

Objective: To conduct cost of illness analysis (COI) of PID in patients in University of Ilorin, Teaching Hospital, Ilorin, Kwara state, North- central Nigeria.

Methods: A one year retrospective review of 2560 case notes of PID patients of which 396 were selected as the sample size from January 2021 to December 2021, in outpatient clinic of university of Ilorin teaching hospital. The selection of the 396 cases was done using systematic random sampling with sample interval of 5. Cost of Illness was determined by prevalence rate method, using direct costs only.

Results: The annual cost of illness for the 396 PID patients on antibiotics was ~~₦4,418,163~~10,646 USD with drugs, diagnostic/monitoring tests, transportation, consultation fees and personnel cost components of 1,780 USD (16.73%), 4,161 USD (39.09%), 666USD (6.26%), 1778(16.70%), 2259 USD(21.22%) respectively. The annual average national cost of illness of PID was ₦ 11, 156.97 (26.86 USD)

Conclusion: The annual average national cost of illness of PID represents 30.9 % of annual health expenditure per capita. This is not particularly high when compared with PID COI estimates achieved for some developed countries. The Annual National cost of illness for PID in Nigeria, a developing economy may be about 69 million USD annually.

Keywords: Analysis, Cost of Illness, Developing Economy, PID

* During the period of this study, 1USD equaled 415 Naira

Introduction

The escalating nature of health care expenditure has forced healthcare organizations, governments and individuals to become more focused on cost containment. The allocation to the health sector is growing, not only as a result of cost increment, but also as a result of growing population and new health development

(Giwa et al 2018 and Curry et al 2019) Furthermore, with the depressing nature of economy in many countries such as where *per capita* income is low, cost containment measures must be taken with extreme caution (Giwa et al 2018).

A country is considered to have a developing economy if it has a low human

development index, little growth, low per capita income, and a preference for agricultural operations over industrialization and entrepreneurship (Okon et al 2009). Nigeria has the most of these attributes, making it a developing economy.

Cost of illness analysis measures the magnitude of resources utilized in the management of illness. Awareness of the magnitude of these resources, will enable planning and cost containment measures.

An illness consumes resources, thus, it has a cost. The cost of an illness is the sum of three components: The medical resources used to treat the illness (direct cost) e.g. hospital care, professional services, drugs and supplies, the non-medical resources associated with it (direct cost) e.g. transportation to treatment site and hiring of home care and lost productivity due to illness or disability (indirect cost). A fourth category, the intangible cost of pain and suffering is often unquantifiable. (Giwa et al 2018).

Pelvic inflammatory disease (PID) is an inflammation of the female upper reproductive/genital tract due to an infection in women affecting the endometrium, uterus, fallopian tubes, ovaries, and pelvic peritoneum (Jennings and Krywko, 2021). It has also been described as a spectrum of upper genital tract infections that includes endometritis, salpingitis, tuboovarian abscess, and/or pelvic peritonitis (Workowski and Berman, 2010).

It is a common disorder of the reproductive tract that is often mis diagnosed and inadequately treated (Das et al, 2016). Studies carried out in England showed that up to 50,000-75,000 women are diagnosed

with PID annually and also that a third of these were young women aged 16-24 years (Price et al, 2016). Currently, an estimated 770,000 cases of acute PID are diagnosed annually in the United States (Sweet, 2011). Over the past decade, the rates of PID have been decreasing, but it is still commonly seen in both outpatient clinics and emergency department settings (Jennings and Krywko, 2021). PID is a pertinent health issue worldwide, particularly among women that are sexually active; the global incidence varies from 0.28% to 1.67% (Oroz et al, 2012). The reported microbial-associated infection in PID with a prevalence of 62.8% is of public health importance (Okonet al, 2008).

Pelvic inflammatory disease (PID) is characteristically an ascending infection which has been known to spread from the lower genital tract. In 85% of cases, the infection is caused by sexually transmitted bacteria (Jennings and Krywko, 2021). The majority of cases of PID globally, are associated with sexually transmitted infections caused by *Chlamydia trachomatis* and *Neisseria gonorrhoeae*, but they are not the only organisms associated with this clinical disease (Jennings and Krywko, 2021). Other cervical, enteric, bacterial vaginosis-associated, and respiratory pathogens, including *Mycobacterium tuberculosis*, may be involved (Curry et al, 2019). In another study done by (Olowe et al, 2012) in Oshogbo, Nigeria, about 70% of patients were positive for infection, and the most commonly isolated organism in this center was *Staphylococcus* in 41.4%, followed by *Klebsiella* species in 24.29%.

Studies done by Sweet in 2011 have described that management of PID and its complications are quite expensive, and similar findings by Spencer (2014), have stated that PID management consumes a major percentage of medical resources from different nations. These findings reveal the socioeconomic burden of the management of PID, especially in developing countries like Nigeria, and Africa as a whole. Some local studies agreed with this, and have confirmed that the prevalence of PID in a society negatively correlates with the socio-economic status of the inhabitants, hence PID is more prevalent in resource poor settings such as Nigeria. It thus becomes more difficult to effectively manage PID in poverty stricken communities, as the cost of management may be too much for the patients to bear for the duration of treatment (Olowe *et al* 2012, Robert *et al* 2015).

There is evidence that prescribing different outpatient PID treatment regimens based on cost differences, clinical opinion regarding relative efficacy and medication characteristics lead to greater adherence, hence, greater effectiveness compared with regimens without those characteristics (Beigi and Wiesenfeld, 2003). However, these studies were not conducted in Nigeria and no similar studies on PID have been conducted in Nigeria.

Cost of illness analysis of PID was conducted in University of Ilorin Teaching Hospital, Nigeria, with a view of guiding resource allocation decisions to improve effectiveness of drug therapy and efficiency of health service.

Method

Setting

The study was conducted at the University of Ilorin Teaching Hospital (UITH), Ilorin, Kwara State, North Central Nigeria. The Hospital was chosen because it is the only University Teaching Hospital in Kwara state and the major referral center in the state. The bed complements for the hospital is 600 and about 50 registered pharmacists are in the employment of the Hospital.

The Hospital runs a medical out-patient department comprising of a general out-patient and specialist medical out-patient clinics. This research was conducted in the obstetrics and gynecology clinic. The clinic is one of the specialist medical out-patient clinics and it is run every Mondays to Fridays.

Study Population and sample size

PID patients that were registered with and attended the obstetrics and gynecology clinic of UITH were the subjects for the study. Their population was obtained from Medical Record Department totaling 2560. Fischer's formula was applied to determine sample size from this estimate (Araoye MO, 2004) the required minimum sample size was 369. A 10% addition was made to take care of possible attrition. This gives a sample size of 396.

Inclusion Criteria were all cases of pelvic inflammatory disease presenting for treatment in UITH and patients aged 18 years and above. However, PID in out-patients and patients <18 years of age were excluded from this study.

Study design

The study was a one year retrospective review of 396 case notes of PID patients. Systematic random sampling method was

adopted using sampling interval of 5 for case notes from Medical Records department until a total of 396 cases that fits the inclusion criteria were obtained. Excluded case notes were skipped along the sampling process.

Data instrument

A data collection form was designed with columns for Code Number as the Patient's Hospital Number, date of visit, demographic data, detailed address, concurrent illness(s), drugs prescribed with duration on each visit and cost, diagnostic/monitoring tests on each visit and cost, transport cost on each visit (to and fro), personnel cost and total cost.

Data collection

The following was noted and extracted from the case notes into the data collection form: Date of Visit, demographic data, concurrent illness, number of visits and prescribed drugs at each visit as well as duration of therapy. Evidence of diagnostic/monitoring test was also noted and recorded.

Economic perspective

Economic perspective of the patient and the hospital were considered since the drugs, diagnostic, consultation, and transport costs were borne by the patients while personnel costs were borne by the Hospital Management.

Cost measure

Only direct costs were considered. These include the cost of drugs, diagnostic/monitoring tests, consultation, transportation, and personnel.

Drug costs were obtained from the pharmacy price list and the cost per defined daily dose (C/DDD) were calculated. Cost per Defined

Daily Dosage (C/DDD) units as recommended by World Health Organization (WHO) for analysis of drug use was applied. DDD represents usual dosage of a drug per day. Duration of therapy was then taken into consideration for calculation of the total cost for each drug.

Costs of diagnostic/monitoring tests were obtained from the laboratory and radiology department of the hospital thus: costs for High Vaginal Swab (HVS), Endocervical Swab (ECS) and Urine microbiology culture and sensitivity tests were obtained from the microbiology laboratory. Costs for abdominopelvic ultrasound scan was obtained from the radiology department while costs for Full Blood Count (FBC) was obtained from the hematology laboratory. The total was thereafter computed.

Cost of Physician consultation were obtained (from Health Information department of the Hospital) while estimated cost of transportation (from National Union of Road Transport Workers NURTW) and cost of personnel salaries (from accounts department of the hospital).

Time and motion studies were carried out to calculate the average time expended by all attending personnel. Average time for 15 random observations for completion of tasks such as consultation, counselling, documentation, measurement of blood pressure and dispensing respectively by these groups of personnel was determined and recorded. The average salaries were then considered where necessary.

The mean salary per minute was calculated as follows:

Mean Salary/min = $\frac{\text{Annual Salary}}{\text{Hours/week} \times \text{number of weeks/annum} \times 60}$
(Giwa et al, 2018)

In the calculations, the respective number of visits was considered.

In the calculations, the respective number of visits were considered.

Cost of Illness computation

In measuring Cost of Illness (COI)

- The average annual cost of illness (based on the 396 PID patients)=
 $\frac{\text{Annual COI for 396 patients}}{396}$
- The annual National COI = average annual COI for PID x Prevalence rate of PID x Population of Nigeria

Ethical issues

Ethical clearance was obtained from the ethics and research committee of the University of Ilorin Teaching Hospital. Approval number was ERC/PAN/2022/03/0258. Written permission was also

sought and obtained from the Head of Health Information Department, UITH

Data Analysis

The major outcome of this studies which are cost measures were presented as united states dollars (USD) and naira (₦) with the conversion rate of 1USD equals 415 Naira. Other cost measures were presented as percentages of total costs. Data analyses were performed using SPSS version 20 (IBM Corporation, Armonk, NY, USA).

Results

Total cost per year of individual drugs for 396 subjects on Antibiotics for treatment of PID

Total cost per year of individual antibiotics for management of PID for 396 patients was highest for Tablet Ciprofloxacin and lowest for Tablet erythromycin and Injection gentamycin with components of ₦140,140 (338USD), ₦980 (2USD) and ₦1080 (3USD) as indicated in table 1 below:

TABLE 1: Total Cost per Year of Individual Drugs For 396 Patients

S/N	ANTIBIOTIC	DOSE (DDD)	TOTAL ANNUAL DRUG COST Naira (*USD)	% ANNUAL TOTAL DRUG COST	% ANNUAL COST OF ILLNESS
1	Ciprofloxacin tab	500mg *bd	140,140 (338)	19.0	3.17
2	Secnidazole tab	2g *stat	49,000 (118)	6.6	1.11
3	Metronidazole tab	400mg *tds	90,300 (218)	12.2	2.04
4	Azithromycin cap	1g *stat	24,000 (58)	3.3	0.54
5	Sparfloxacin tab	200mg*od	1575 (4)	0.2	0.04
6	Doxycycline cap	100mg bd	120,960 (291)	16.4	2.74
7	Amoxicillin/Clavulanic acid tab	625mg bd	42,000 (101)	5.7	0.95
8	Amoxicillin/Clavulanic acid tab	1g bd	33,250 (80)	4.5	0.75
9	Ceftriaxone inj	1g stat	47,500 (114)	6.5	1.08

10	Ofloxacin tab	400mg bd	33, 600 (81)	4.5	0.76
11	Ornidazole/Ofloxacin tab	500/200mgbd	38, 500 (93)	5.2	0.87
12	Levofloxacin tab	500mg bd	2000 (5)	0.3	0.05
13	Ciprofloxacin/Tinidazole tab	500/600mg bd	7680 (19)	1.0	0.17
14	Clotrimazole/Metronidazole/Lactobacillus spores pessary	100/500/150 million 1 nocte	10, 800 (26)	1.5	0.24
15	Cefixime tab	400mg bd	12, 420 (30)	1.7	0.28
16	Gentamycin inj	160mg od	1080 (3)	0.1	0.02
17	Amoxicillin cap	500mg tds	17, 850 (43)	2.4	0.40
18	Clarithromycin tab	500mg bd	2100 (5)	0.2	0.05
19	Tinidazole/Ofloxacin tab	400/600mg bd	54, 600 (131)	7.4	1.24
20	Erythromycin tab	500mg qds	980 (2)	0.1	0.02
21	Cefuroxime tab	500mg bd	6440 (16)	0.9	0.15
22	Secnidazole/Azithromycin/Fluconazole	2g/1g/150mg stat	2300 (6)	0.3	0.00
	TOTAL		739, 075	100	16.67

***USD - US Dollars,*OD to be taken every 24hours,*bd - to be taken every 12hours,
*tds – to be taken every 8hours,*qds – to be taken every 6hours*stat – to be administered at once.* During the period of this study, 1 Naira equaled 415 USD**

Annual Cost of Illness for the 396 Subjects on Antibiotics for the treatment of PID

The annual cost of illness of the 396 PID patients on antibiotic therapy was ₦4,418,163(10,646 USD) with drug, diagnostic/monitoring tests, transportation, care/support and personnel components of 1,780USD (16.73%),4,161USD (39.09%),666USD (6.26%), 1,778USD (16.70%)and 2,259 USD (21.22%) respectively.

The average annual national cost of illness of PID was ₦ 11, 156.97 (26.86 USD) as shown on table 2 below

TABLE 2: Annual Cost of illness for 396 Subjects on Antibiotics For the Treatment of PID

COST FACTOR	TOTAL ANNUAL COST Naira (USD)	% ANNUAL COST OF ILLNESS
DRUG	739, 075 (1780)	16.73
DIAGNOSTIC TEST	1, 727, 000 (4161)	39.09
TRANSPORT	276, 570 (666)	6.26
CONSULTATION FEE	738, 000 (1778)	16.70
PERSONNEL	937, 518 (2259)	21.22
TOTAL	4, 418, 163 (10, 646)	100.00

Average Annual National Cost of Illness for PID = ~~₦~~ 11, 156.97 (26.86 USD)

With the above average annual cost of illness per patient for PID and a prevalence rate of 5.7% (Howells and Okwudili, 2018) which represents 2, 421, 315 patients (5.7% of 42, 479, 202- total population of Nigerian women of childbearing age- UNICEF, 2022), the annual national cost of illness in Nigeria for PID would be ~~₦~~27,014,558,186 (**69,879,150 USD**), excluding indirect and Intangible costs.

Discussion

The average annual cost of illness (COI) for PID was ~~₦~~ 11, 156.97 (**26.86 USD**) amounting to 1.2% of annual per capital income in the country and 30.9% of health expenditure per capita of Nigeria, using recent projected reports of *per capita* income of about 2400USD per annum (Nigeria GDP *per capita*- 2021 Data- 2022 Forecast). This confirms that, despite the dwindling economic situation in Nigeria, PID treatment does not constitute a significant burden on individual finances, and there is hope that with proper sensitization and improvement of health seeking attitudes, the standard of PID care will improve in Nigeria.

The indirect cost (cost due to morbidity, disability, premature mortality and loss of productive output) was excluded in this study. There is room to increase the amount of resources dedicated to PID diagnosis and research, as the economic burden of PID care in Nigeria is not particularly high. This also points to the fact that about 26.86 USD per person may be saved if PID eradication is achieved as a result of aforementioned preventive measures.

The average annual (national) cost of Illness of ~~₦~~ 11, 156.97 (**26.86 USD**) for PID observed in this study, was lower than the cost of a PID episode (260 USD) found in a UK study done by Aghaizuet *al* in 2011 and that (222 USD) found in another study by

Adams *et al.* (2007). A study by Nuovo *et al* (1995) also reported the cost to treat outpatient PID as \$195. The higher Cost of Illness for PID in developed countries may be due to availability of state of the art technology, improved drugs and insurance policies, which are expected to increase the Cost of Illness (Trent *et al*, 2011). Furthermore, an analysis of Trent *et al.* (2011)'s study using hospital charges revealed that the estimated direct costs for initial PID treatment are significantly lower in ambulatory settings. The average annual cost of illness ~~₦~~ 11, 156.97 (**26.86 USD**) takes into cognizance the direct costs of therapy only, that is, the costs of procuring drugs, costs of transportation, cost of diagnostic test(s), personnel cost, and consultation costs.

This study found the annual cost of illness in Nigeria to be ~~₦~~ 27 billion (69 million USD). This is quite small (about 0.01%) when compared with the total 445 billion USD GDP for Nigeria in 2022.

Although this annual cost of illness is underestimated as costs for complications and inpatient admissions were excluded, the economic burden is largely borne from out-of-pocket expenses of individuals who majorly live below the poverty line. In America, (Rein *et al.*, 2000) found the cost of illness for PID to be 1.88 billion USD in 2000. This figure however included cost of illness of the PID sequelae such as infertility and ectopic pregnancy (Rein *et al.*, 2000).

The total cost of running diagnostic tests accounting for ₦1, 727, 000 (4,161 USD) was found to be highest (39.09%) among all direct costs considered for 396 patients. This huge cost of diagnostic test is based on the fact that no single test can be used to accurately diagnose PID but diagnosis is optimized with combination of diagnostic findings that improve sensitivity or specificity (Haggerty and Ness 2006, CDC 2021). The total cost of drugs was ₦ 739, 075 (1,780 USD) accounting for 16.73% of the overall total cost of illness. This was slightly higher than that reported in a study conducted in a secondary health facility in northern Nigeria by Omole and Ibrahim (2011) where the cost was found to be ₦652,382 (1,572 USD). This may be due to the rise in inflation in the Nigerian economy. The total annual cost of drug was highest for Ciprofloxacin tablet accounting for ₦ 140,140 (338 USD), followed by Doxycycline capsule at ₦120, 960 (291 USD), and Metronidazole Tablet at ₦90, 300 (218 USD). Erythromycin Tablet has the lowest total annual cost of ₦ 980 (2 USD). Patients who were placed on the Ciprofloxacin/Doxycycline/Metronidazole (empirical regimen) were able to afford their drugs as these drugs were cheaper than other drug regimens with either ceftriaxone and azithromycin (Savaris *et al*, 2017). Heinonen *et al* (1989) recorded a success rate of 70% for patients placed on this empirical regimen.

Ceftriaxone injection had the highest mean cost per defined daily dose (C/DDD) of 2500 ± 0 while Metronidazole tablet had the lowest mean cost per defined daily dose (C/DDD) of 30 ± 0 . There was no difference between the mean cost per defined daily dose (C/DDD) of Ciprofloxacin tablet when

compared with a similar study done in Minna, Nigeria where 70 ± 0 was reported (Omole and Ibrahim, 2011). However, the mean cost per defined daily doses (C/DDD) of Metronidazole and Doxycycline were higher in the current study. This could be attributed to the fact that the current study was carried out in a tertiary health facility as opposed to the other study which was done in a secondary health facility. It is observed that patients at secondary health centers cannot afford more expensive drugs especially in underdeveloped countries like Nigeria. Therefore, they will benefit from regimens with lower C/DDD and are more likely to be adherent to their drugs.

The Average Annual National Cost of Illness for PID in this study was ₦ 11, 156.97 (26.86 USD) and the annual Cost of Illness for 396 PID patients was ₦ 4, 418, 163 (10,646 USD). The major driver of the cost of illness was found to be diagnostic test while the annual national Cost of Illness in Nigeria for PID with a prevalence of 5.7% and representing 2, 421, 315 patients was ₦ 27,014,558,186 (69,879,150 USD), excluding indirect and intangible costs.

Efforts should be made by the Nigerian government in adopting Pharmacoeconomic principles in the National Health Policy and allow its application at all levels of healthcare delivery system in taking therapeutic and other healthcare intervention decisions and also in providing awareness of various preventive measures for PID.

Efforts should also be made by the hospital managements in ensuring that therapeutic committee publishes/updates hospital formulary such as Standard Treatment Guidelines from time to time while ensuring

that physicians prescribe based on protocols in the hospital formulary.

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