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Predictors of Ectopic Pregnancy Secondary to Acute Pelvic Inflamatory Disease

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Abstract
Background
Ectopic pregnancy is quite common in developing countries, and predominantly caused by tubal disease, such as pelvic inflammatory disease (PID).
Objective
The objective of this study is to determine the factors in women with PID that are associated with ectopic pregnancy, with respect to maternal demographic factors, pelvic pathological findings on ultrasound scan, and the pathogenic microorganism isolated on endocervical culture.
Materials and methods
This was a case control study of 189 women who were diagnosed with acute pelvic inflammatory disease at the Niger Delta University Teaching Hospital (NDUTH), Yenagoa in Southern Nigeria, from January 2007 to January 2015. These patients were evaluated 5 years later (In January 2020) for ectopic pregnancy as a complication of PID; a total of 34 cases were identifies and evaluated.
Information relevant to this study retrieved from the case notes of these patients includes: maternal demographic factors like age, parity, occupation, address, educational level, tribe, religion, and marital status. Others were gynaecological factors like the probable cause of PID, findings on ultrasound scan evaluation, the organisms isolated from endocervical culture, and a history of recurrent PID.
Analysis was carried out using the women who had PID, but did not develop ectopic pregnancy as control. Categorical variables were compared with odds ratio, difference in mean was compared with student's t-test, and the degree of association for quantitative variables was determined using Pearson's correlation coefficient. Predictor variables were determined by simple linear regression, and multivariate analysis. Confidence interval was set at 95%, and statistical significance was set at p value of < 0.05.
RESULTS
The rate of ectopic pregnancy among the women who had PID was 17.9 %. They were predominantly single p = 0.03, unemployment p = 0.02, and with low parity (mostly para1), odds ratio = 0.37(0.15, 0.92), p = 0.02. Though the mean maternal age was, 27.3 ± 6.5, the chances of having ectopic pregnancy was 4 times higher among teenagers, odds ratio = 4.20(6.96, 18.42), p = 0.04, and 5 times among women with recurrent PID, odds ratio = 5.63(2.52, 12.53), p = 0.0002.
The presence of pelvic collection and hydrosalpinx increased the rate by 5 and 6 fold respectively, with odd ratios of 6.86 (1.10, 42.76), and 5.82 (1.03, 32.79). On multivariate analysis, the most significant predictor variables were recurrent PID (r^2 = 10.8%), the organism cultured on endocervical swab (r^2 = 6.0%), and marital status (r^2 = 2.4%).
Conclusion
The most significant predictors of ectopic pregnancy in women who had PID in Yenagoa were recurrent PID, upper genital tract infection with Klebsiella species, and being single. This could be applied clinically as prognostic factors, and for patient counseling, especially if validated by studies in other centers.
Key words: *Pelvic inflammatory disease, ectopic pregnancy, predictor variables.*

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I. Introduction

Pelvic inflammatory disease (PID) is an ascending infection of the upper genital tract, and it encompasses: endometritis, salpingitis, tuboovarian abscess, and/or pelvic peritonitis. [1,2]

PID is a global health problem, and the global prevalence of PID has been reported as 4% - 12%. [2] However, its impact is more felt in developing countries, especially in West Africa, because of the high rate of sexually transmitted infections, and the low socioeconomic status of our women. [1] In Sub-Sarahan Africa, it was reported to account for 17- 40% of gynecological admissions. [3] Other reported rates are 15 – 37% in South East Asia, and 32% in a remote community in Northern Australia. [3]

Several risk factors for PID have been identified globally, and include sexually transmitted infections (STI), post abortal sepsis, puerperal sepsis, uterine surgical procedures, and intrauterine contraceptive device. [4, 5] However, the most reported risk factor is STI; it has been reported to account for over 85% of the cases of PID. [5]

The pathogenesis of PID is preceded by bacterial infection of the vagina and cervix; this could result in inflammation of the cervix (cervicitis). With subsequently ascend to the uterus, endometritis may occur. Involvement of the fallopian tubes and ovaries leads to salpingitis and oophoritis. In the absence of adequate treatment, the infection may spread to the pelvic peritoneum; this may result in pelvic peritonitis, pelvic abscess and tuboovarian mass. [6, 7]

The commonest pathogenic organisms responsible for PID globally are *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. [8, 9] Results from a study in the UK revealed that 14% of PID was caused by *Neisseria gonorrhoeae,* while 39% was by *Chlamydia trachomatis.* [10] In the US, serological evidence of *Chlamydia trachomatis*, was found in 20 – 40% of the women with PID. [11] In Nigeria, hospital-based studies revealed that other relatively common pathogens are *Escherichia coli*, *proteus species*, *pseudomonas*, *Staphylococcus aurous, trichomonas vaginalis, and Klebsiella* species. [12, 13]

Other pathogenic organisms reported in various centers are *mycobacterium tuberculosis,* granulomatous salpingitis caused by *schistosoma species,* and *mycoplasmahominis,* others are *ureaplasma urealyticum, , gardnerella vaginalis,* and *mycoplasma genitalicum,* [12, 14, 15] However, these are not commonly reported in Nigeria.

PID is often devastating, especially in West Africa where complications are common; it a potential source of ectopic pregnancy, infertility, chronic pelvic pain, and dysmenorrhea. [5, 16] Reports from a previous study in Calabar in Nigeria indicated that 63.2% of ectopic pregnancies were caused by PID. [16] However in Nnewi, also in Nigeria, 35.5% of cases of ectopic pregnancies were said to be caused by PID. [12]

Ectopic pregnancy is implantation of the fertilized ovum outside the uterine cavity, and over 95.5% occur in the fallopian tube. [17] The most predominant pathological factor associated with ectopic pregnancy in women with PID is tubal damage [17]. Ultrasonography and laparoscopic findings have revealed various types of tubal damage, which include: peritubal adhesions, hydrosalpinx, and tubal blockage from mucosal swelling, hyperemia and adhesions within the tubal lumen. [1, 18]

Naturally, the fallopian tube is not capacious enough to accommodate a growing fetus; hence tubal rupture is bound to occur early, usually within 6 – 8 weeks gestation. [3, 17] Contrary to what obtains in developed countries, where early diagnosis is made, a great majority of patients in the developing world present for treatment when tubal rupture has occurred. A study at University of Abuja Teaching Hospital in Nigeria reported that at presentation, 83.1% of the ectopic pregnancies had ruptured. [19] The rates of rupture at presentation in other centers in Nigeria are 70.1% in Sokoto, [20] and 95.7% in Port Harcourt. [21]

Ruptured ectopic pregnancy is very dangerous because of torrential intra-abdominal hemorrhage and shock; if not detected and managed on time, the mortality rate is very high. In Sub-Saharan Africa where the rate of ruptured ectopic pregnancy is very high, the case fatality rate for ectopic pregnancy was reported as 1 – 3 %, which was said to be 10 times higher than what obtains in developed countries. [22] However, a study in Athens in Greece reported mortality rate of 6% - 9%. [23]

Though ectopic pregnancy has been widely studied globally, and tubal damage from PID has been publicized as a predominant etiological factor. However, there is little information on the predictors and factors in women with PID that significantly predispose them to ectopic pregnancy; hence the need for this study.

II. Objective

The objective of this study is to determine the factors in women with PID that are associated with ectopic pregnancy, with respect to maternal demographic factors, pelvic pathological findings on ultrasound scan evaluation, and the pathogenic microorganism isolated on endocervical culture.

III. Materials and methods

Study site

The study was carried out at the gynaecology emergency unit, the gynaecology ward and theatre of department of obstetrics and gynaecology, Niger Delta University Teaching Hospital (NDUTH). This hospital is located in Yenagoa, the capital of Bayelsa State in Southern Nigeria. As the apex hospital in the state, it serves

as a referral center for all other health institutions. It also receives patients from parts of the neighboring states, such as Rivers and Delta States.

Study design
This was a case control study of 189 women who were diagnosed with acute pelvic inflammatory disease from January 2008 to January 2016 at the Niger Delta University Teaching Hospital (NDUTH) Yenagoa. These patients were evaluated 5 years later (In January 2020) for ectopic pregnancy as a complication of PID; a total of 34 cases were identified.

Inclusion criteria
Included in this study were women who were diagnosed and managed for acute PID in NDUTH, and those who subsequently developed ectopic pregnancy as a complication.

Exclusion criteria
Excluded were women who were treated for ectopic pregnancy without evidence of previous history of PID, these were mainly women referred from other hospitals, and those on self referral. Also excluded were women who had chronic PID, because of the diagnostic challenges.

Data collection
This study was carried out at the gynaecology clinic, accident and emergency unit, gynaecology ward, and gynaecology theatre in NDUTH, a total of 1,248 women who were admitted for gynaecological problems during the period of study were identified. Out of these, 189 women were diagnosed and treated for acute PID, and among these women, 34 developed ectopic pregnancy.
The case notes of these patients were retrieved from the hospital records, and information relevant to this study was obtained. These includes: maternal demographic factors like age, parity, occupation, address, educational level, tribe, religion, and marital status. Others were gynaecological factors like the probable cause of PID, findings on ultrasound scan evaluation, the micro organisms isolated from endocervical culture, and a previous history of PID.
Information concerning treatment of PID and ectopic pregnancy was excluded as it was beyond the scope of this study. Findings at laparoscopy were also not included, because it is not commonly done on women with acute PID in this centre.

Data analysis
Data collected from each subject was entered into SPSS version 25 for windows, and EPI info version 7 software. Categorical variables were compared with odds ratio, difference in mean was compared with student's t-test, and the degree of association for quantitative variables was determined using Pearson's correlation coefficient. Predictor variables were determined using simple linear regression, and multivariate analysis. Confidence interval was set at 95%, and statistical significance was set at p value of < 0.05.

Ethical committee approval
Approval to proceed with this study was granted by the ethical committee of NDUTH; reference number NDUTH/REC/0048/2022.

IV. Results

Out of a total of 189 women who were diagnosed and treated for acute PID during the study period, 34 women had ectopic pregnancy, give a rate of 17.9%

Table 1: Mean values of the maternal demographic factors

Risk factor	PID without ectopic pregnancy	PID with ectopic pregnancy	Student's t	Mean difference	P value
Maternal age (in years)	38.5 ± 5.9	27.3 ± 6.5	11.20	9.84 [8.95, 13.45]	0.0001
Parity	0.94 ± 1.5	1.03 ± 1.24	0.33	0.09 [-0.46, 0.64]	0.74

Most of the women who had ectopic pregnancy were of low parity, with a mean of 1.03 ± 1.24. The mean maternal age among these women was 27.3 ± 6.5 years, this was however significantly lower than those without ectopic pregnancy, 38.5 ± 5.9 years, $p = 0.0001$.

Table 2: Frequency distribution of the demographic and gynaecological variables

Variable	PID without ectopic pregnancy N = 155	PID with Ectopic pregnancy N = 34	Total N = 189	Odds Ratio	P Value
Maternal age					
≤ 19 years	11(5.8)	5(2.6)	16(8.5)	4.20(6.96, 18.42)	0.04
20 – 24 years	38(20.1)	8(4.2)	46(24.3)		
25 – 29 years	34(18.0)	6(3.2)	40(21.2)	2.58(0.66, 10.11)	0.16
30 – 34 years	34(18.0)	10(5.3)	44(23.3)		
35 – 39 years	37(19.6)	4(2.1)	41(21.7)		
40 – 44 years	1(0.5)	1(0.5)	2(1.1)		
≥ 45years	-	-	-		
Total	155(82.0)	34(18.0)	189(100)		
Parity					
Para 0	91(58.7)	15(7.9)	106(56.1)		
Para 1	25(16.1)	11(5.8)	36(19.0)	0.37(0.15, 0.92)	0.02
Pare 2	20(12.9)	3(1.6)	23(12.2)	1.10(0.29, 4.16)	0.88
Para 3	6(3.9)	2(1.1)	8(4.2)	0.49(0.09, 2.68)	0.40
Para 4	6(3.9)	3(1.9)	9(4.8)		
Para 5	4(2.6)	-	4(2.6)		
≥ Para 5	3(1.9)	-	3(1.9)		
Total	155(82.0)	34(18.0)	189(100)		
Address					
Rural	34(18.0)	7(3.7)	41(21.7)		
Semi urban	75(39.7)	20(10.6)	95(50.3)	1.75(0.69, 4.47)	0.23
Urban	46(24.3)	7(3.7)	53(28.0)	1.35(0.43, 4.22)	0.60
Total	155(82.0)	34(18.0)	189(100)		
Educational level					
Non formal	1(0.5)	1(0.5)	2(1.19		
Primary	19(10.1)	1(0.5)	20(10.6)		
Secondary	60(31.7)	19(10.1)	79(41.8)	0.55(0.25, 1.20)	0.18
Tertiary	75(39.7)	13(6.9)	88(46.6)		
Total	155(82.0)	34(18.0)	189(100)		
Occupation					
unemployed	58(30.7)	16(5.8)	74(39.2)	0.17(0.04, 0.80)	0.0.02
Civil servant	40(21.2)	4(2.4)	44(23.3)		
Petty trader	1(0.5)	1(0.5)	2(1.1)		
Student	49(25.9)	11(5.8)	60(31.7)		
Business	7(3.7)	2(1.1)	9(4.8)		
Total	155(82.0)	34(18.0)	189(100)		
Marital status					
Married	86(45.5)	12(6.3)	98(51.9)		
Single	69(36.5)	22(11.6)	91(48.1)	0.44(0.20, 0.95)	0.03
Total	155(82.0)	34(18.0)	189(100)		
Tribe					
Igbo	50(26.5)	11(5.8)	61(32.3)		
Ijaw	73(38.6)	14(7.4)	87(46.0)		
Hausa/Fulani	2(1.1)	-	2(1.1)		
Yoruba	13(6.9)	2(1.1)	15(7.9)		
Other tribes	17(9.0)	7(3.7)	24(12.7)		
Religion					
Christian	144(76.2)	29(15.3)	173(91.5)		
Muslim	11(5.8)	5(2.6)	16(8.5)		
Total	155(82.0)	34(18.0)	189(100)		
Previous treatment for PID					
None	113(59.8)	11(5.8)	124(65.5)		
Previous PID treatment	42(22.2)	23(12.2)	65(34.4)	5.63(2.52, 12.53)	0.0002
Total	155(82.0)	34(18.0)	189(100)		
Probable cause of PID					

No identified risk factor	5(2.6)	1(0.5)	6(3.2)		
Sexually transmitted infections (STI)	85(45.0)	14(7.4)	99(52,4)	1.86(0.83, 4.17)	0.19
Post abortion complication	49(25.9)	15(7.9)	64(33.9)		
Puerperal sepsis	8(4.2)	1(0.5)	9(4.8)		
Post IUCD insertion	8(4.2)	1(0.5)	9(4.8)		
Following uterine procedure	-	3(1.6)	3(1.6)		
Finding on pelvic scan					
No identified pathology	16(8.6)	2(1.1)	18(9.5)		
Fluid in POD only	87(48.7)	9(1.5)	96(50.8)	0.87(0.17, 0.14)	0.79
hydrosalpinx	7(3.7)	6(3.2)	13(6.9)	6.86 (1.10, 42.76)	0.02
Tubo-ovarian mass	2(1.1)	-	2(1.1)		
Pelvic collection	11(5.8)	8(4.2)	19(10.7)	5.82 (1.03, 32.79)	0.03
Scan was not done	32(16.9)	9(4.8)	41(21.7)		
Total	155(82.0)	34(18.0)	189(100)		
Micro organism isolated (on endocervical culture)					
No bacterial growth	6(3.2)	-	6(3.2)		
Staphylococcus aurous	39(20.6)	2(1.1)	41(21.7)		
E coli	26(13.8)	5(2.6)	31(16.4)		
Coliform species	5(2.6)	1(0.5)	6(3.2)		
Klebsiella	55(29.1)	16(8.5)	71(37.6)		
Pseudomonas	13(6.9)	3(1.9)	16(8.5)		
Streptococcus	6(3.2)	7(3.7)	13(6.9)		
Proteus	5(2.6)	-	5(2.6)		
Total	155(82.0)	34(18.0)	189(100)		
Other PID complications					
No complication	83(43.9)	10(5.3)	93(49.2)		
infertility	61(32.3)	21(11.1)	82(44.4)		
Chronic pelvic pain	8(4.2)	2(1.1)	10(5.3)		
dysmenorrhea	3(1.6)	1(0.5)	4(2.1)		
Total	155(82.0)	34(18.0)	189(100)		

Most of the women 46(24.3%) who had acute PID in this study were young, 20 – 24 years. However, the chances of having ectopic pregnancy was 4 times higher among those ≤ 19 years, odds ratio = 4.20(6.96, 18.42), p = 0.04.

The rate of acute PID was higher among women of low parity (para 1), 36(19.0%). The ectopic pregnancy rate was also significantly higher among women in this age group, odds ratio = 0.37(0.15, 0.92), p = 0.02.

Evidence from this study indicates that most 95(50.3%) of the women with PID live in semi urban environment. However, the rate of ectopic pregnancy was not significantly different from women living in rural or urban areas.

With respect to employment, most of the women who had acute PID 74(39.2) were unemployed, followed by students 60(31.7%). The rate of ectopic pregnancy was significantly higher among unemployed women, odd ratio = 0.17(0.04, 0.80), p = 0.02.

Though acute PID was commoner among married women, 98(51.9%) vs. 91(48.1%) the rate of ectopic pregnancy was significantly higher among single women, 0.44(0.20, 0.95, p = 0.03.

The results from this study also indicates that women with previous history of PID were 5 times more likely to develop ectopic pregnancy, odds ratio = 5.63(2.52, 12.53), p = 0.0002

Out of 13(6.9) women who developed hydrosalpinx as a complication of PID, 6(3.2%) had ectopic pregnancy. The presence of hydrosalpinx was 6 times more likely to result in ectopic pregnancy, odds ratio = 6.86 (1.10, 42.76), p = 0.02. Similarly, women who were treated for pelvic collection were 7 times more likely to develop ectopic pregnancy 5.82 (1.03, 32.79), p = 0.03.

The microbial organism most commonly implicated in acute PID in NDUTH was *Klebsiella species*, accounting for 37.6% of the cases, and infertility was the most common associated complication of PID, accounting for 44.4%.

Table 3
Correlation between risk factors for PID and ectopic pregnancy

Demographic factor	Pearson's correlation coefficient
Maternal age	- 0.075
Parity	0.023
Occupation	0.072
Address	-0.42
Educational level	-0.066
Marital status	0.155
Religion	0.105
Tribe	0.092
Previous treatment for PID (recurrent)	0.328
Findings on ultrasound scan	0.113
Micro organism isolated (endocervical culture)	0.257
Probable cause of PID	0.128

Table 4
Simple linear regression of the predictor variables for ectopic pregnancy in women who had acute PID

Predictor variable	r^2 %	F - ratio	P value
Previous treatment for PID (recurrent)	10.8	22.527	0.000
Micro organism (endocervical culture)	6.0	13.183	0.000
Marital status	2.4	4.616	0.033
Probable cause of PID	1.7	3.138	0.078
Findings on ultrasound scan	1.3	2.412	0.122
Religion	1.1	2.084	0.150
Tribe	0.8	1.585	0.210
Maternal age	0.6	1.052	0.306
occupation	0.5	0.982	0.323
Educational level	0.4	0.830	0.363
Address	0.2	0.336	0.563
Parity	0.1	0.102	0.744

For women who had acute PID in the past, the most important predictor for ectopic pregnancy is a history of recurrent PID, accounting for 10.8% of the cases. This is followed by the type of micro organism cultured on endocervical swab (6.0%), and marital status (2.4%).

Table 5
Stepwise multivariate analysis of the significant predictor variables for ectopic pregnancy in women who had acute PID

Predictor variable	Step 1	Step 2	Step 3	Step 4
Previous PID	0.328	0.328	0.328	0.328
Micro organism		0.385	0.385	0.385
Marital status			0.408	0.408
Etiology (risk factor)				0.430
Constant	0.089	-0.040	-0.192	-0.276
r^2	10.8	14.9	16.7	18.4
F- ratio	22.527	16.221	12.345	10.409
P value	0.000	0.000	0.000	0.000

Cumulatively, the influenced posed by the 3 significant predictor variable: history of recurrent PID, the type of micro organism cultured on endocervical swab, and marital status could only account for 18.4%.

V. Discussion

Pelvic inflammatory disease, an ascending infection of the upper genital tract is about the commonest cause of tubal disease, which is the most prominent cause of ectopic pregnancy in West Africa. [1, 16] It is worthy to note that though ectopic pregnancy has caused significant morbidity and mortality in West Africa, a much more common complication of PID in this Sub-region is infertility. [24] Despite the fact that infertility is not associated with mortality, the sufferers experience profound psychological and physical trauma, marital disharmony and hopelessness. [24, 25]

Though PID is very common in our environment, the diagnosis, especially for chronic PID is quite challenging; the symptoms vary widely from patient to patient, and are imprecise. [26] In addition, chronic PID symptoms tend to mimic other pathologies like acute appendicitis and endometriosis. [26, 27] As a result, we only used patients diagnosed with acute PID in this study.

As a policy in this hospital, we employ the Hagar's criteria to make the diagnosis of acute PID more accurate. It requires the presence of at least one major, and two or more minor signs and symptom to make a diagnosis. The presence of abdominal pain and tenderness, cervical motion tenderness, and adnexal tenderness were the major criteria. While the minor were oral temperature ≥ 38°C, mucopurulent vaginal discharge, leukocytosis ≥ 10,000/ml, and presence of gram-negative intracellular diplococcic or *Chlamydia trachomatis* . [28, 29]

The 17.9% ectopic pregnancy rate we obtained in our study, among women previously managed for PID, was much lower than what was reported in other centers in Nigeria; 63% in Calabar, [16] and 35.5% in Nnewi. [12] This is most probably because these studies focused on the etiology of ectopic pregnancy, while we were interested in the prevalence among women previously diagnosed with PID. A similar study (a retrospective cohort study) was carried out in Taiwan, where women with PID were reported be 2.12 more likely to develop ectopic pregnancy (P = 0.003), with a cumulative incidence rate of 1, 63%. [30] However, these rates were much lower than ours, because we used prevalence.

Though PID as major cause of ectopic pregnancy is well publicized in West Africa and globally, there are just a handful of studies that critically evaluates the factors, and the predictor variables in women with PID that predisposes them to ectopic pregnancy.

The relationship between marital status and ectopic pregnancy was well established in our study, as significantly more single women were affected. This is however not different from findings from other centers in the West Africa. A study in Oromia region in Ethiopia, it was reported that ectopic pregnancy was 4 times more likely to occur in single women, AOR = 4.04:9 (1.23–13.21). [31] Another study in Ethiopia reported that single women were 10 times more likely to have ectopic pregnancy, AOR =10.81 (3.601, 32.465). [32]

Another demographic factor that has been reported to significantly predispose women with PID to ectopic pregnancy is maternal age. However, our mean age of 27.3 ± 6.5 years did not deviate widely from findings in other centers in Nigeria; a mean age of 27.9 ± 5 years was reported in Port Harcourt and 29 ± 5.5 years in Delta State. Findings outside Nigeria was similar; a Research Institute in Chennai in India, reported that the most vulnerable age range for ectopic pregnancy was 26 – 30 year. [33]

Evidence from our study revealed that low parity was significantly associated with ectopic pregnancy; this was not surprising because women with PID are prone to tubal blockage and infertility. Blockage of the fallopian tube has been reported to account for 30 - 40 % of infertility in women, [34] and a great majority resulted from adhesions within the tubal lumen, and hydrosalpinx. [35] Hydrosalpinx does not only cause tubal obstruction, but as evidenced in this study, it's a major predisposing factor to ectopic pregnancy. It has also been reported to be toxic to the embryo, and prophylactic removal before IVF has been advocated. [35, 36]

Recurrent PID has been associated with adverse reproductive outcome in previous studies, [37] and results from our study are in conformity with this observation. Based on evidence from multivariate analysis in this study, recurrent PID is a strong predictor for ectopic pregnancy. This is however not surprising because repeated infection and inflammation of the upper genital tract is expected to cause more, and severe tubal damage, which could predispose to ectopic pregnancy.

A very prominent predictors observed in this study was the type of micro organism that infected the genital tract. We discovered that *Klebsiella species* was the most common organism associated with PID related ectopic pregnancy in Yenagoa. However, more studies on this subject matter needed to be conducted in this environment to validate our findings.

Evidence from hospital based studies in Nigeria revealed *Staphylococcus aureus,* [38, 39] and *Klebsiella species* [12] as the most pathogenic organism isolated in women with PID. However, the global picture tends to favor *Neisseria gonorrhoeae* and *Chlamydia trachomatis* as the most common. [9, 40] The variation may be related to the fact that many centers in Nigeria (including NDUTH) lack the capacity to culture *Neisseria gonorrhoeae* and *Chlamydia trachomatis.*

Though the maternal demographic and the gynaecological factors enumerated above play a significant role in occurrence of ectopic pregnancy in women with PID, these factors as evidenced by multivariate analysis could only account for 18.4%. This implies that 81.6% of the factors were not captured in our study. These could be factors that cause tubal damage within the tubal lumen, which was beyond the scope of this study. Further studies are hereby advocated.

VI. Conclusion

The most significant predictors of ectopic pregnancy in women who had PID in Yenagoa were recurrent PID, upper genital tract infection with *Klebsiella species*, and being single. This could be applied clinically as prognostic factors, and for patient counseling, especially if validated by studies in other centers.

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