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Epidimiology of Aerobic Bacterial Infections among IUD (Intrauterine Device) Users in the Northern West Bank

وبائية عدوى البكتيريا الهوائية بين السيدات اللواتي يستعملن اللوالب في شمال الضفة الغربية

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Abstract

Intra uterine device (IUD) is the most popular method of contraception among Palestinian women. It is one of the very effective contraceptive methods with very small failure rate. Infection has been the main problem that faces women using IUD all over the world. The aim of this study is to explore the epidemiological pattern of aerobic bacterial infections among IUD users in Northern West Bank /Palestine. A study sample included two hundred women (134 IUD users and 66 non-IUD users) from MOH (Ministry of Health) FP (family planning) clinics. These women were randomly selected, interviewed, then cervical swabs were collected and cultured for aerobic bacteria, all data were analyzed using SPSS software. The study results showed overall significant higher rate of isolated bacteria among IUD users compared to non-users (P value < 0.05), with a significant relationship between infection and the type of IUD. However there was no overall significance in relation to duration of use (P value > 0.05). More than 50% of the positive culture results were predominant bacteria, and some 40% were potentially pathogenic. β Hemolytic streptococcus was the most frequent of the former and E. Coli of the latter .Overall the study results were consistent with the current literature.

Key words: *IUD users, aerobic bacteria, infection, Palestine.*

ملخص

يعتبر اللولب من اكثر الوسائل شيوعا في فلسطين، حيث يعتبر من اكثر الوسائل فاعلية، بسبب انخفاض نسبة الفشل في استخدامه. تعتبر التهابات الجهاز التناسلي من أهم المشاكل التي تواجه السيدات اللواتي يستخدمن اللولب في جميع انحاء العالم. تهدف هذه الدراسة التحليلية المقارنة الى دراسة النمط الوبائي للبكتيريا الهوائية بين السيدات اللواتي يستخدمن اللوالب في محافظات شمال الضفة الغربية في فلسطين. تم اختيار العينة الدراسية المكونة من مائتي سيدة (134 سيدة يستخدمن اللولب، 66 سيدة لا يستخدمنه) من عيادات تنظيم الأسرة التابعة لوزارة الصحة الفلسطينية في محافظات شمال الضفة الغربية. وقد تم إجراء مقابلة شخصية مع كل سيدة وتعبئة

نموذج خاص ومن ثم اخذ عينة من عنق الرحم للزراعة والكشف عن البكتيريا الهوائية. تم استخدام البرنامج الإحصائي *SPSS* في التحليل الاحصائي. اظهرت نتائج الدراسة ان معدل انتشار البكتيريا الهوائية كانت أعلى بين السيدات اللواتي يستخدمن اللوالب بالمقارنة مع اللواتي لا يستخدمنه وكان الفرق مهما احصائيا (الدالة الإحصائية اقل من 0.05)، مع وجود فرق مهم احصائيا (الدالة الإحصائية اقل من 0.05) نتيجة اختلاف نوع اللولب أما بالنسبة للمدة الزمنية لاستخدامه فلم يكن هناك بشكل عام فرق مهم.(الدالة الإحصائية اكثر من 0.05). اكثر من 50% من نتائج الزراعة الايجابية كانت من نوع البكتيريا السائدة وحوالي 46% من نوع البكتيريا المحتمل ان يكون مسببا للمرض مع كون بكتيريا *β Hemolytic Streptococcus* هي الاكثر شيوعا في النوع الاول وبكتيريا *E. Coli* هي الاكثر شيوعا في النوع الثاني. بشكل عام فان نتائج الدراسة كانت متوافقة مع ما سبقها من دراسات .

Introduction

Reproductive tract infections (RTI) are common among women all over the world. An important type is associated with medical procedures that manipulate the genital tract such as abortion, pelvic examination, and IUD insertion [(1)].

IUD is one of the most popular contraceptive methods used world wide, it ranked the second among other methods after sterilization. Nearly 86 million women around the world use IUD. The use of IUD varies from 32% of women at reproductive age in China to less than 2% in Nigeria, and Brazil [(2)].

The most common type used in Egypt, Turkey, Indonesia and Pakistan is Copper IUD, mainly the Copper-T 380 A [(2)].

Different studies were conducted to explore the IUD related diseases particularly those associated with infection. Some studies linked the infection-related disease to the insertion method and technique [(3-6)].

During reproductive age, women withhold large number of facultative bacteria, as streptococcus, staphylococcus and beta-hemolytic streptococcus, (which may be transmitted to the neonate during child birth causing meningitis and other diseases [(7)].

The importance of studying the aerobic bacterial microorganism as *E-Coli* lies in fact that these organisms are opportunistic pathogens in the female genital tract and are involved in the pathogenesis of urinary tract infections. Furthermore, *Staphylococcus aurous* has a role in toxic shock syndrome [(8)]. Vaginal microflora are classified into two groups, the first is the predominant bacteria with *Staphylococcus epidermidis* being an example, the other group is the potentially pathogenic, such as *Staphylococcus aurous, E-Coli, Streptococcus group A* [9].

The aim of this study is to explore the relationship between aerobic bacterial infections and IUD use in Palestine. The study also aims at finding the relationship between duration of use, and the type of IUD.

Methodology

1. Sample Selection

The study population consisted of women visiting government family planning clinics in the four northern West Bank districts (Nablus, Qalqelia, Jenin, Tulkarm).Women were either requesting IUD insertion, or already using IUD and visiting the clinic for check up.

It was proposed to conduct this study on the nine districts of the West Bank but due to difficult transportation after Al-Aqsa Intifada, the study was limited to the northern districts. The study clinics were the four central clinics in the northern West Bank run by MOH. These clinics were selected because of the high utilization rate (> 50 women/ per month).

The study sample was randomly selected (Every third woman visiting the clinic was included in the study) with the following exclusion criteria:

1. Heavy blood during menstrual period at the time of sample collection
2. Antibiotic use during previous 15 days.
3. Diabetic patients.

The annual report of these clinics in 1999 showed that the total number of clients in the four districts were (2439), ranking as, 1199(49%), 700 (29%) 300(12%), 240(10%), for Jenin, Nablus, Tulkarm, and Qalqulia respectively. Therefore, the study sample consisted of a total of 200 women according to the total utilization rate of the clinic in each district, Jenin: 98 women (49%), Nablus 58 women (29%), Tulkarm 24 women (12%), and 20 women from Qalqulia (10%). This distribution made the sample representative of women utilizing family planning clinics.

2. Data Collection

Data were collected between September 2000- January 2001 using structured interview and cervical swab specimen collection.

A. Instrument

A structured questionnaire interview was the main instrument. The Questionnaire used in the interview has been evaluated, reviewed carefully, and then pre-tested on 10 women, and it consisted of two parts: The first focused on sociodemographic characteristics of respondents in terms of women's age, education, occupation and years of schooling. The second involved obstetric history in terms of the previous pregnancies, parity and abortion, menstrual period and related problems, and the use of contraceptives either the ever use or the current method.

The purpose of the study was explained to each woman and informed consent was also obtained. Serial number was used, and each woman was given the same serial number on the filled questionnaire and the swab culture container.

The researcher interviewed each woman, to fill the questionnaire, then when the same women underwent vaginal exam including insertion of speculum; the researcher also obtained endo-cervical swab using a sterile cotton swab. The swab was inserted in the cervix and pulled around for 60 seconds and then put in wet media (Stewart Emma media) for transport.

B. Laboratory analysis

In the lab the specimens were cultured on a blood and Macchonky agar for 24 hours at 37◦C. Sensitivity of antibiotics was also done.

3. Data analysis

All the data collected through the questionnaire and results of the laboratory tests were entered and computed using SPSS software and applying Chi-Square test with significance at P value≤0.05.

Results

1. Social profile of the population study

Table 1 shows the sociodemographic characteristics of the study sample in terms of age, education, and occupation. The age group of the sample ranges between 19-45 years old, 57% of the population study was in the 20-30 age groups, 36.5% were in 31-40 year age group. The lowest percent was for the age group <20 and>40, forming only 3% and 3.5%.

Most of IUD users were in the age group 20-30, and 30-40(35% and 28% of the study sample). Concerning the non-users, most of them were in the age group 20-30(22% of the study sample).

More than 50% of the sample had good education (39.5% had secondary education, and 12.5% had college education). Most of women in the study were housewives (85.5%).

Table (1): Social profile of population study

	Category	IUD users		Non users		Total	
		N.	%	N	%	N	%
Age	<20	1	0.5	5	2.5	6	3
	20-30	70	35	44	22	114	57
	31-40	56	28	17	8.5	73	36.5
	>40	7	3.5	0	0	7	3.5
	Total	134	67	66	33	200	100
Women Occupation	Housewife	112	56	59	29.5	171	85.5
	Working	22	11	7	3.5	29	14.5
	Total	143	67	66	33	200	100
Women Education	Elementary	31	15.5	4	2	35	17.5
	Preparatory	39	19.5	22	11	61	30.5
	Secondary	49	24.5	30	15	79	39.5
	College	15	7.5	10	5	25	12.5
	Total	134	67	66	33	200	100

2. *Results of Laboratory Culture Test*

2.1 Culture results

Table 2 shows the results of the swab culture by the type of organism and percentage. 128(64%) of all cultured swabs were positive, while 72(36%) had no growth. Of the positive results, 25% were *Beta –Hemolytic Streptococcus*, 21% were *Group B Streptococcus*, and *E-Coli* reached up to 17.2%. Other types were *S-aurous* (9.4%), *Klebsiella* (8.6%) and *Coagulase negative Staphylococcus* (7.8%).

Table (2): Frequency & Percent of isolated microorganism

Type of bacteria	Count	Percent
B-Hemolytic	32	25.0%
G B S	27	21.0%
E-Coli	22	17.2%
S-aurous	12	9.4%
Klebsiella	11	8.6%
Coagulase –ve	10	7.8%
Enterobacter	3	2.3%
Enterobacter +Klebsiella	3	2.3%
E-Coli +B-Hemolytic	2	1.6%
E-Coli +Enterobacter	2	1.6%
E-Coli +Klebsiella	1	0.8%
Klebsiella +B- Hemolytic	1	0.8%
S- aurous + pseudo	1	0.8%
S aurous E –Coli	1	0.8%
Total	128	100.0%

2.2 Groups and Types of Isolated Bacteria:

The types of isolated bacteria were classified into two groups; the first one was the habitat or predominant bacteria in the genital tract, this group comprised 53.9%. *B-Hemolytic streptococcus* formed the majority of this group, *GBS (Group B streptococcus*) ranked as second, and the rest were *Coagulase negative Staphylococcus* making 25%, 21%, and 7.8% respectively from all positive results. The second group of isolated organisms was the potentially pathogenic bacteria .*E-Coli* ranked the first among this group (17.2%), followed by *S-aurous*, then *Klebsiella* and *Enterobacter* ,forming 9.4%,8.6%,and 2.3% respectively from all positive results (See table 2).

3. Culture results and bacteria group in relation to the IUD use

The results showed that the total number of positive cultures was 128(64%), 71.9% of the positive culture were IUD users and 28.1% were non-users, this difference was statistically significant (P=0.037). The positive cultures among the IUD users were 92, 52.2% were potentially pathogenic bacteria, and 47.8% were predominant bacteria. The potentially pathogenic bacteria reached up to 30.5% of the positive cultures among non-users while the predominant bacteria were 69.5%,the differences between IUD users & non users in both cases were statistically significant (P=0.0001). The positive cultures among the copper-T users reached up to 69.2% (34.6 predominant bacteria and 34.6 potentially pathogenic). 66.7% of the Multi-Load users had positive swabs (40.8 potentially pathogenic and 25.9% predominant bacteria). This difference in growth between the two types of IUDs was statistically significant (P=0.0001) see (table 3).

Table (3): Culture Result In Relation To Use of IUD

Result of the test	**Non Users**		**IUD users**		**Total**		***P* value**
	N	**%**	**N**	**%**	**N**	**%**	
Growth	36	28.1	92	71.9	128	100	0.037
No growth	30	41.7	42	58.3	72	100	
Total	**66**	**33**	**134**	**67**	**200**	**100**	

Bacterial Groups in Relation to IUD use

Bacteria Group	**USE of IUD**				**Total**		***P* value**
	Non users		**IUD users**				
	N	**%**	**N**	**%**	**N**	**%**	
Potentially Pathogenic	11	30.5	48	52.2	59	46.1	0.0001
Predominant bacteria	25	69.5	44	47.8	69	53.9	0.0001
Total	**36**	**100**	**92**	**100**	**128**	**100**	

Culture Results & type of IUD

Culture Results	**Type of IUD**				**Total**		**P value**
	Multiload		**Copper T**				
	N	**%**	**N**	**%**	**N**	**%**	
No growth	9	33.3	33	30.8	42	31.4	0.0001
Potentially Pathogenic	11	40.8	37	34.6	48	35.8	0.0001
Predominant bacteria	7	25.9	37	34.6	44	32.8	0.0001
Total	**27**	**100**	**107**	**100**	**134**	**100**	

4. Culture results in relation to duration of use / months:

Table 4 shows the relationship between the duration of use and positive culture. During the first year, more than 70% of users had positive culture (41.3% potentially pathogenic and 31.7% predominant bacteria).The negative culture (no growth results) reached up to 31.3% among the IUD users, most of them(about 40%) were during the first year of use. The percent of potentially pathogenic swabs decrease with increasing duration of use(41.3-16.7%), while the percentage of predominant bacteria increases (31.7-44.4%).Although there was significant relationship between growth and duration for each period (P<0.05),the overall relationship was not statistically significant (P = 0.413).

Table (4): Culture results in relation to duration of IUD use

Culture results	**Duration of use/month**				**Total**	***P* value ****
	<12	**13-24**	**25-36**	**>36**		
	N %	**N %**	**N %**	**N %**	**N %**	
No growth	1727	1340.6	523.8	.738.9	4231.3	
Pot.Pathogenic	2641.3	1237.5	733.3	316.7	4835.9	0.413
Predominant	2031.7	721.9	942.9	844.4	4432.8	
Total	**63100**	**32100**	**21100**	**18100**	**134100**	
***P* value**	**0.0001**	**0.0001**	**0.0001**	**0.006**		

* *P **value** when comparing bacterial growth & no growth in relation to each period of duration.*

** *P **value** when comparing bacterial growth & no growth in relation to overall duration.*

Discussion

According to the Palestinian statistical bureau survey, it was found that IUD is the most popular method among other contraceptive methods; the overall ever use rate was (38.2%), and current use is 47.6%. At the same time most of users start to use IUD after having the 3rd child (10). In our study more than half of the study population (57%) was in the age group of 20-30 years, just 3% were below 20 years old. This reflects the national policy of the FP program in the MOH, which does not prefer to apply the IUD to young age, or to nulli-para women. And also goes along with the Palestinian statistical bureau 2000, which states that the percent of women who are currently using IUD at the age 20 and younger is 3.7 % (10).

In our study, different types of aerobic bacteria were isolated by endo-cervical swab culture, these were *Beta-Hemolytic streptococcus, GBS, E-coli, S-aurous, Klebsiella, Coagulase –negative Staphylococcus and Enterobacter* (Table 2).

These findings are supported by different studies, which have been conducted in the 1980's to evaluate the bacteria that adhere to IUD, and colonize the vagina and cervix during IUD use. In one study ,E-Coli was the most common microorganism [11], in another study ,*GBS, E-Coli and Streptococcus* were isolated from the cervical canal and ectocervix of women with IUD [12]. In a third one *GBS, S-aurous, Enterococcus, and Candida albicans*, were cultured from the tailed IUD in contrast to the tailless IUD which remained sterile in uterus [13].

Also our results match with recent studies, one study [14] found that endogenous infection (Candida, bacteria) diagnosed by culture were higher among IUD users (53%) than non-users (32%), others isolated *coagulase-negative Staphylococcus*, *Streptococcus* and *E-Coli* in moderate concentration from the IUD users [15-16].

Regarding studies performed on Arab and Muslim women, An Iraqi study found a strong association of Klebsiella with IUD use (14.5%) and much less association with isolation of E-Coli and S-aurous in percent of 4.3% and 8.7 % respectively [17].

Few studies explained the isolation of these types of bacteria among the IUD users. These studies found that isolation of E-Coli were higher among IUD users than those who use no contraceptives, also higher during 1-7 days of menstrual cycle than in pre-menstrual, and higher among women with history of UTI [8,18].

The effect of menstrual cycle phase on the isolation of *E-Coli* or *Streptococcus* bacteria explains the presence of these types of bacteria among the non-users in our study, taking in consideration that this group has attended the clinic while conducting the study to initiate use of IUD, (usually the time of insertion is at 5-7th day of the menstrual cycle).

Our findings in table 3 show that more than two third (68.7%) of IUD users had positive culture, almost equally divided between potentially pathogenic (52.2%) and predominant bacteria (47.8%).

In the non-user group however,the isolated predominant bacteria (69.5%) were twice the potentially pathogenic (31.3%).

These results can be explained by several previous studies in the past that explained the role of IUD in changing normal vaginal flora. One study related this to the tail and string of the IUD by its effect on transmission of the pathogenic microorganisms and so the role of ascending infection[6]. A second study related the infection to mechanism of action; considering that IUD produces an inflammatory reaction which thought to interfere with fertilization. At the same time, IUD was considered as any other device or catheter and so has its role in developing infections associated with foreign body[19]. It was found that the pattern of IUD–associated infections included acute endometritis, pelvic inflammatory disease, and unilateral ovarian abscess. Aerobic and anaerobic flora of female genital tract account for most of IUD infections[19]. Another study evaluated the different factors affecting flora of the female genital tract such as pH, estrogen, and concentration of the mucous, which depends on the female age. During reproductive age women withhold large number of facultative bacteria, as *Streptococcus*, *Staphylococcus* and beta-*hemolytic Streptococcus*, (which may be transmitted to the neonate during child birth causing meningitis and other diseases [7].

Recent studies in USA reported a relationship between aerobic bacteria, IUD use and bacterial vaginosis, being considered as a risk factor in one [20], and being associated with aerobic bacteria in another [8].

Table 4 shows positive association between positive culture swabs and IUD use during the first year, which was statistically significant. This finding can be explained by studies that explored the role of technique and insertion through the vagina in introducing the bacteria to the cervix and uterine cavity, [3-4,8,21], causing higher rate of bacteria during the first month after insertion [6].

These studies also explain our results in table 4 that show high percentage of potentially pathogenic bacteria among IUD users during the first year after insertion with significant decrease of this type of bacteria after 36 month of IUD use.

Conclusions, Limitations, and Recommendations

This is the first study regarding IUD related infection among Palestinian women. Using the culture swab technique our study revealed significantly higher prevalence rate of isolated aerobic bacteria related to RTI among IUD users compared to non-users. Our study shows that RTI is quite common among Palestinian women. There was a positive relationship between the isolation of aerobic bacteria and the use of IUD, with significant difference in the isolation of bacteria and the type of IUD (in favour of Copper T). Regarding the duration of IUD use, there is a significant increase of potentially pathogenic bacteria among IUD users during the first year of use, although the overall relationship between infection and duration of IUD use was not statistically significant.

Our study points to a relatively high incidence of endogenous infection among women, however cultures were only done for aerobic bacteria. There might be other microorganisms that need to be identified by other laboratory techniques. Action program at the family planning clinic level including training the health care workers in the management of endogenous infection in women, with emphasis on better diagnostic techniques is called for.

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