ISSN 2313-7347 (print)
ISSN 2500-3194 (online)

АКУШЕРСТВО ГИНЕКОЛОГИЯ РЕПРОДУКЦИЯ

Включен в перечень ведущих рецензируемых журналов и изданий ВАК

2020 • том 14 • № 4

OBSTETRICS, GYNECOLOGY AND REPRODUCTION

2020 Vol. 14 No 4

www.gynecology.su

ISSN 2313-7347 (print)
ISSN 2500-3194 (online)

https://doi.org/10.17749/2313-7347/ob.gyn.rep.2020.144

Prevalence and associated risk factors of urinary tract infection in pregnancy at the Douala General Hospital, Cameroon: a case–control study

Wague W.Ch. Dayas Francine[1], Theophile Nana-Njamen[2,3], Njimanted Omarine[1], Doretta N. Egbe[4], George E. Enow-Orock[2], Thomas O. Egbe[2,3]

[1]University of Bamenda, Bamenda, Cameroon;

[2]University of Buea, Buea, Cameroon;

[3]Douala General Hospital, Douala, Cameroon;

[4]University of Douala, Douala, Cameroon

Corresponding author: *Thomas O. Egbe, e-mail: toegbe@gmail.com*

Abstract

Introduction. The burden of urinary tract infection (UTI) in pregnancy has been understudied in Cameroon.

Aim: to determine the prevalence and risk factors of UTI in pregnancy in a tertiary hospital in Cameroon.

Materials and methods. A hospital-based matched case-control study of pregnant women with evidence of UTI and those without who underwent antenatal care and gave birth at the Douala General Hospital from January 2014 to December 2018. Demographic, reproductive health/clinical data were collected using a pre-tested questionnaire and analyzed with SPSS.

Results. The prevalence of UTI in pregnancy was 4.41 %. Poor antenatal care uptake (AOR = 5.64; 95 % CI = 2.21–14.33), multiple weekly sexual intercourses (AOR = 4.64; 95 % CI = 0.22–96.94), a history of UTI (AOR = 3.01; 95 % CI = 1.12–8.04) and drying the genitals from back to front (AOR = 5.50; 95 % CI = 1.95–15.44) were associated factors.

Conclusion. The prevalence of UTI in pregnancy is low amid multiple associated factors. Screening for UTI in pregnancy should be made the standard of obstetric care in Cameroon.

Keywords: urinary tract infection, associated risk factors, pregnancy

For citation: Dayas Francine W.W.C., Nana-Njamen T., Omarine N., Egbe D.N., Enow-Orock G.E., Egbe T.O. Prevalence and associated risk factors of urinary tract infection in pregnancy at the Douala General Hospital, Cameroon: a case–control study. *Akusherstvo, Ginekologia i Reprodukcia = Obstetrics, Gynecology and Reproduction*. 2020;14(4):426–436. https://doi.org/10.17749/2313-7347/ob.gyn.rep.2020.144.

Распространенность и связанные с ней факторы риска инфекции мочевыводящих путей во время беременности в больнице общего профиля в Дуала, Камерун: исследование «случай-контроль»

В.В.К. Дайас Франсин[1], Т. Нана-Нжамен[2,3], Н. Омарин[1], Д.Н. Эгбе[4], Д.Э. Эноу-Орок[2], Т.О. Эгбе[2,3]

2020 • Vol. 14 • № 4
Obstetrics, Gynecology and Reproduction

[1]Университет Баменды, Баменда, Камерун;

[2]Университет Буэа, Буэа, Камерун;

[3]Больница общего профиля, Дуала, Камерун;

[4]Университет Дуалы, Дуала, Камерун

Для контактов: Томас Обинчемти Эгбе, e-mail: toegbe@gmail.com

Резюме

Введение. Бремя инфекции мочевыводящих путей (ИМП) у беременных в Камеруне изучено недостаточно.

Цель исследования: определить распространенность и факторы риска ИМП у беременных в центре специализированной медицинской помощи Камеруна.

Материалы и методы. В клиническом исследовании типа «случай–контроль» с участием беременных были сопоставлены показатели женщин с ИМП и без таковой среди тех, кого наблюдали до родов и родоразрешали в многопрофильном госпитале Дуалы в период с января 2014 г. по декабрь 2018 г. Демографические данные, данные о репродуктивном здоровье, клинические данные были собраны с помощью предварительно протестированной анкеты и проанализированы с использованием программы SPSS.

Результаты. Распространенность ИПМ у беременных составила 4,41 %. Ассоциированными факторами риска явились низкая комплаентность к дородовому наблюдению (AOR = 5,64; 95 % CI = 2,21–14,33), неоднократная интимная близость в течение недели (AOR = 4,64; 95 % CI = 0,22–96,94), ИМП в анамнезе (AOR = 3,01; 95 % CI = 1,12–8.04) и протирание гениталий в направлении от спины кпереди (AOR = 5,50; 95 % CI = 1,95–15,44).

Заключение. Распространенность ИМП во время беременности является низкой, несмотря на множество ассоциированных факторов риска. Скрининг на наличие ИМП во время беременности должен стать стандартом акушерской помощи в Камеруне.

Ключевые слова: инфекция мочевыводящих путей, ассоциированные факторы риска, беременность

Для цитирования: Дайас Франсин В.В.К., Нана-Нжамен Т., Омарин Н., Эгбе Д.Н., Эноу-Орок Д.Э., Эгбе Т.О. Распространенность и связанные с ней факторы риска инфекции мочевыводящих путей во время беременности в больнице общего профиля в Дуала, Камерун: исследование «случай–контроль». *Акушерство, Гинекология и Репродукция.* 2020;14(4):426–436. (In English). https://doi.org/10.17749/2313-7347/ob.gyn.rep.2020.144.

Highlights

What is already known about this subject?

- Urinary tract infection (UTI) is common in pregnant women and is associated with adverse outcomes.
- Treatment of asymptomatic bacteriuria reduces the rate of clinical infection to 3–4 %.
- Pyelonephritis is a common and severe complication of UTI in pregnancy and puerperium.

What are the new findings?

- The use of antiseptic solutions (chlorhexidine) for vulvar toiletting and cleaning/drying the vulvar from back to front increases the risk of UTI.

How might it impact on clinical practice in the foreseeable future?

- If screening for UTI is effected early in the first trimester of pregnancy, maternal-fetal outcomes may be better. Therefore screening for UTI should be made standard of obstetric care.

Основные моменты

Что уже известно об этой теме?

- Инфекция мочевыводящих путей (ИМП) часто встречается у беременных и связана с неблагоприятными исходами.
- Лечение бессимптомной бактериурии снижает распространенность инфекции, сопровождающейся клиническими проявлениями, до 3–4 %.
- Пиелонефрит – распространенное и тяжелое осложнение ИМП во время беременности и в послеродовой период.

Что нового дает статья?

- Использование антисептических растворов (хлоргексидина) для ухода за наружными половыми органами и протирание в направлении от спины кпереди повышает риск ИМП.

Как это может повлиять на клиническую практику в обозримом будущем?

- Проведение скрининга на наличие ИМП в начале I триместра беременности улучшает исходы для матери и плода. Поэтому скрининг на наличие ИМП должен быть стандартом акушерской помощи.

Introduction / Введение

Urinary tract infection (UTI) is a common clinical problem and is an infection caused by the presence and growth of microorganisms in the urinary tract. It affects all age groups but women are more susceptible than men due to their short urethra, absence of prostatic secretion, pregnancy and easy contamination of the urinary tract with faecal flora [1]. UTI is the second common infection occurring during pregnancy [2]. It is noteworthy that UTI in pregnant women begins as early as the 6th week of pregnancy and reaches its peak at 22–24 weeks gestation and about 90 % of these women develop urethral dilatation [3].

A study of 1253 pregnant women in India reported that the proportion of women with symptoms of UTI on the basis of history was 33.3 % (95 % confidence interval [CI] = 30.7–35.9), and UTI by colony count was 3.3 % (95 % CI = 2.4–4.5) [4]. Another study in Tanzania reported a prevalence of UTI of 16.4 % among pregnant women of which 17.9 % and 13.0 % were symptomatic bacteriuria (SB) and asymptomatic bacteriuria (ASB) respectively [5].

The known risk factors associated with UTI in pregnant women include grand multiparity, frequent sexual intercourse, diabetes mellitus, immunosuppression, sickle cell disease, previous UTI, and genitourinary anomalies [6]. Other studies have reported a significant prevalence of UTI among pregnant women including risk factors like low socio-economic status, past history of UTI, frequent sexual intercourse, anemia, and diabetes mellitus [6–8].

Several microorganisms have been associated with UTI although *Escherichia coli* is the most frequent accounting for 80 % to 90 % of UTI's in pregnancy [1, 9–11].

In Cameroon, there is a dearth of studies regarding the prevalence of UTI and its associated risk factors in pregnancy despite the fact that it causes major complications on the pregnant women and their fetuses [3]. Therefore this study is aimed at elucidating the prevalence and associated risk factors of UTI among pregnant women.

It is anticipated that knowledge on this subject will contribute to the reduction of maternal and perinatal morbidity/mortality from UTI among pregnant women. We hypothesize that the prevalence of UTI at the Douala General Hospital is low and there is no association between UTI in pregnancy and its associated risk factors at the Douala General Hospital. Therefore, our objectives were to determine the prevalence and associated risk factors of UTI at the Douala General Hospital, Cameroon.

Materials and methods / Материалы и методы

Study design and duration / Дизайн и продолжительность исследования

This was a hospital based matched case–control study of files of patients retrospectively from January 1, 2014 to December 31, 2018 to obtain the prevalence of UTI with a prospective component from January 1, 2019 to April 30, 2019 to study the associated risk factors of UTI.

Study area and setting / Область исследования и окружение

We enrolled study participants at the Obstetrics and Gynecology wards of the Douala General Hospital (DGH). The DGH is a referral tertiary care health facility that offers emergency obstetrics care, scientific treatment, teaching and research to a population of over three million inhabitants of the Littoral region and its environs. The hospital is located in Douala, an urban town, and also the economic capital of Cameroon. The Obstetrics and Gynecology department offers the following: outpatient consultations, antenatal care (ANC), hospitalization, labour, delivery and gynecologic and obstetric surgery including laparoscopic and hysteroscopic surgery and colposcopy. The service is made up of 8 obstetricians-gynecologists, one general medical practitioner and 39 midwives and nurses/assistant nurses. There are 30 beds that assure in-service admission care of patients that is shared as 8 common rooms and 6 private rooms and a nurse's station. The labor room has 4 beds and there are 2 delivery rooms totaling 2 beds and a room for neonatal resuscitation. Averagely, there are 1250 births per year in the service. The neonatology unit has a capacity of 10 incubators, and there are 6 pediatricians and 15 specialized nurses that take charge of the neonatal intensive care unit. The service runs 24/7, and there is always one obstetrician-gynaecologist and a pediatrician in the hospital to take charge of call duties.

Study population / Участники исследования

Files of pregnant women who came to the outpatient unit and those admitted to the Obstetrics and Gynecology department of the DGH were enrolled for study.

Inclusion criteria / Критерии включения

Cases / Случай

Consenting (written informed consent) pregnant women who came for antenatal care and had a positive diagnosis of UTI by dipstick or culture, or those admitted at the Obstetrics and Gynecology department of the DGH during the period of study.

Files of pregnant women who gave a verbal consent and gave birth at the Douala General Hospital.

Controls / Контроль

Files of consenting pregnant women without (asymptomatic or symptomatic) UTI with negative dipstick or culture, who consulted at the OPD of the Obstetrics and Gynecology department of the DGH during the period of study.

Files of pregnant women who gave verbal consent, with a negative dipstick or culture who gave birth at the Douala General Hospital during the study period.

Exclusion criteria / Критерии исключения

We excluded all the files of pregnant women who did not give birth at the Douala General Hospital and those

2020 • Vol. 14 • № 4
Obstetrics, Gynecology and Reproduction

pregnant women who were taking antibiotics for any underlying infection.

Matching criterion / Критерий соответствия

A woman in the case group was matched by age to one woman in the control group giving a 1:1 ratio.

Study procedure / Этапы исследования

Furthermore, we carried-out pre-testing of the questionnaire on 15 pregnant women from another health facility (the Bambui Health centre) for content validity and comprehension and adjustments were made. Thereafter, we collected data from patient's files at the Obstetrics and Gynecology wards of the DGH by using the convenient and consecutive sampling method. In addition, we obtained verbal consent from patients' by phone and we completed the information that was lacking from the patients' files. The data collection form contained information regarding:

• Socio-demographic characteristics: age, profession, marital status, and residence.

• Risk factors: frequency of sexual intercourse per week, anomaly of the genitourinary tract, personal hygiene, past history of UTI, history of gestational diabetes mellitus, kidney failure, gravidity, type of toilet at home, gestational age.

• Symptoms: fever, increased urine frequency, dysuria, lumbar pain, burning sensation, haematuria.

• Laboratory test: urine dipstick Medi-Test Combi 10™ (Macherey-Nagel GmbH & Co., Germany), number of colonies, urine culture and microorganism isolated.

Ethical aspects/ Этические аспекты

Ethical clearance was obtained from the Institutional Review Board of the University of Bamenda and Administrative Authorization was obtained from the Delegation of Public Health for the Littoral Region and the Managing Director of the DGH (Ref. No. 044 AP/MINSANTE/HGD/DM/03/19). We respected the ethical principles of the Helsinki declaration while carrying out this study [10] and reporting was according to the Strobe guidelines for a case-control study.

Definition of Operational terms / Определения используемых терминов

Urinary tract infection: UTI is defined as the presence of 100000 (10^5) microorganisms per milliliter of urine in an asymptomatic patient, or as more than 100 organisms/ml of urine with accompanying (> 5 WBCs/HPF) in a symptomatic patient.

Bacteriuria: significant bacteriuria is defined as a finding of more than 10^5 colony-forming units per milliliter of urine.

Data management and analysis / Обработка и анализ данных

Data collected were double checked, coded and entered into CSPro version 7.2 and exported and analyzed with SPSS version 23 (IBM, USA). The base-line characteristics of the study population were summarized using frequencies, mean and standard deviation (Mean ± SD). All the missing data were coded and were not included in the final analysis. Comparison was made using binary logistic regression to determine the independent effect of the variables by calculating the strength of the association between UTI and associated factors using odds ratio (OR) and 95 % confidence interval (95 % CI). Adjusted OR (for variables which were statistically significant in binary logistic analysis) was computed using multivariable logistic regression to control the confounding variables. Statistical significance two-tailed was set at $p < 0.05$.

Results / Результаты

Study participants enrolled / Количество включенных в исследование

We reviewed a total of 305 files with the diagnosis of UTI or without UTI during their pregnancy but only 206 were eligible for the study. Seventy-three files were excluded because they gave birth out of the Douala General Hospital and 26 were unreachable by phone or did not give consent (**Fig. 1**).

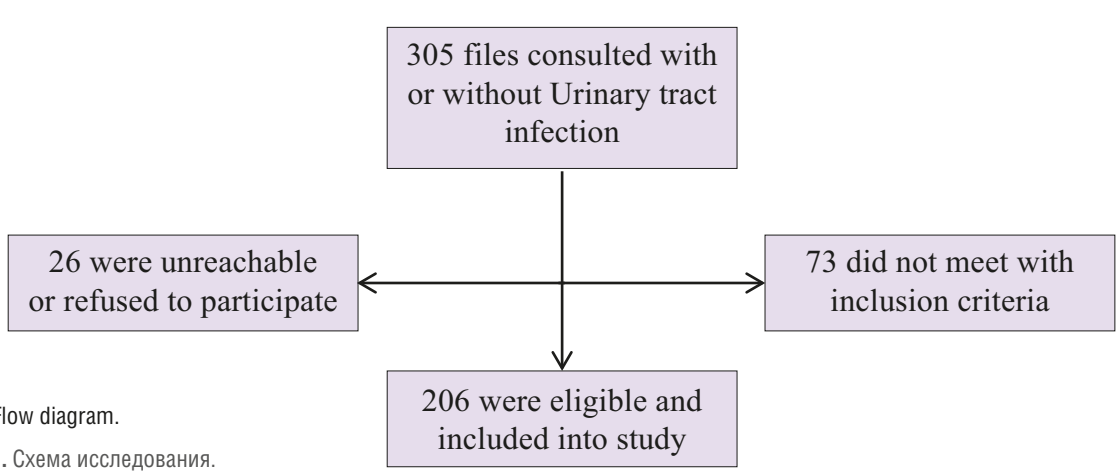

Figure 1. Flow diagram.

Рисунок 1. Схема исследования.

During the study period, a total of 4580 women gave birth or underwent antenatal care visits at the DGH of which 202 (4.41 %) were diagnosed to have UTI.

Table 1 shows that the mean age of cases and controls were similar – 29.61 ± 4.6 (p = 1.000). Besides, the study population was homogeneous (similar) except for respondents who were civil servants (p = 0.03) and those working in the private sector (multinationals) (p = 0.000).

As shown in **table 2**, fever with lumbar pain, increased urinary frequency, dysuria, and burning sensation during micturition were symptoms associated with UTI in this study.

Table 3 shows the reproductive health factors associated with UTI in study population in bivariate analysis. Multiparous women were 2.1 times more likely to have UTI in pregnancy (p = 0.030) while women with low ANC uptake (≤ 4 ANC) were 8.36 times more likely to develop UTI. Furthermore, women with gestational diabetes mellitus and those with more than 3 sexual intercourse per week were 6.04 times (p = 0.020) and 3.03 times (p = 0.000) more likely to develop UTI, respectively.

Figure 2 shows that UTI was common in the third trimester of pregnancy (59.2 %).

Table 4 shows that respondents with a history of UTI were 1.73 times more likely to develop UTI during pregnancy (p-value = 0.030).

As shown in **table 5**, the likelihood of developing UTI increased with increasing frequency of vaginal douching per day by 2.63 and 7.93-folds, respectively. However, the use of chlorhexidine for vaginal toileting and drying the genitalia from back to front increased the odds of UTI by 4.38 and 3.47 times, respectively. Having more than 4 persons using the same toilet increased the odds of UTI by 4.39-folds with a statistically significant mean (p = 0.013). Besides wiping from front to back and having less than 3 persons using a toilette was protective of having UTI.

As shown in **table 6**, the factors independently associated with UTI in pregnancy were: low antenatal care uptake ≤ 4 times, a history of diabetes mellitus, frequency of sexual intercourse ≥ 3 times per week, a history of urinary tract infection, use of chlorhexidine for vaginal douching, drying the genitals organs from back to front.

Table 1. Socio-demographic characteristics of study population.

Таблица 1. Социально-демографические характеристики изучаемой популяции.

Variable Показатель	Cases Случай (n = 103) n (%)	Controls Контроль (n = 103) n (%)	Total Всего (n = 206) n (%)	OR (95 % CI) ОШ 95 % ДИ	p
Age, years:					
< 19	1 (1.0)	1 (1.0)	2 (1.0)	1 (0.03–39.36)	0.750
19–25	15 (14.6)	15 (14.6)	30 (14.6)	1 (0.46–2.2)	0.580
26–30	43 (41.7)	43 (41.7)	86 (41.7)	1 (0.57–1.75)	0.560
31–35	35 (34.0)	35 (34.0)	70 (34.0)	1 (0.56–1.79)	0.560
> 35	9 (8.7)	9 (8.7)	18 (8.7)	1 (0.37–2.71)	0.600
Mean ± SD	29.61 ± 4.69	29.61 ± 4.69	–	–	1.000
Profession:					
Civil servant	36 (35.0)	23 (22.3)	59 (28.6)	1.87 (1.01–3.49)	0.030
Self employed	12 (11.7)	9 (8.7)	21 (10.2)	1.38 (0.55–3.55)	0.320
Housewife	14 (13.6)	15 (14.6)	29 (14.1)	0.92 (0.41–2.05)	0.500
Private sector	14 (13.6)	31 (30.1)	45 (21.8)	0.37 (0.18–0.74)	0.000
Student	27 (26.2)	25 (24.3)	52 (25.2)	1.11 (0.59–2.09)	0.440
Level of education:					
Uneducated	0 (0)	1 (1.0)	1 (0.5)	0 (0–19)	0.500
Primary	3 (2.9)	5 (4.9)	8 (3.9)	0.59 (0.11–2.62)	0.360
Secondary	21 (20.4)	26 (25.2)	47 (22.8)	0.76 (0.39–1.46)	0.250
Tertiary	78 (75.7)	70 (68.0)	148 (71.8)	1.47 (0.8–2.73)	0.140
Marital status:					
Married	77 (74.8)	66 (64.1)	143 (69.4)	1.66 (0.91–3.04)	0.070
Single	25 (24.3)	36 (35)	61 (29.6)	0.6 (0.32–1.1)	0.060
Religion:					
Christian	96 (93.2)	94 (91.3)	190 (92.2)	1.31 (0.46–3.86)	0.400
Muslim	5 (4.9)	4 (3.9)	9 (4.4)	1.26 (0.31–5.42)	0.500
Jehovah witness	1 (1.0)	5 (4.9)	6 (2.9)	0.19 (0.01–1.43)	0.110
Nationality:					
Cameroonian	102 (99.0)	103 (100.0)	205 (99.5)	0 (0–19)	0.500
Foreigner	1 (1.0)	0 (0)	1 (0.5)	–	–

Note: *OR – Odds Ratio; CI – Confidence interval; SD – Standard deviation.*

Примечание: *OR – отношение шансов; CI – доверительный интервал; SD – стандартное отклонение.*

2020 • Vol. 14 • № 4
Obstetrics, Gynecology and Reproduction

Table 2. Symptoms of urinary tract infection among the study population (bivariate analysis).

Таблица 2. Симптомы инфекции мочевыводящих путей среди исследуемой популяции (бивариантный анализ).

Symptoms Симптомы	Cases Случай (n = 103) n (%)	Controls Контроль (n = 103) n (%)	Total Всего (n = 206) n (%)	OR (95 % CI) ОШ 95 % ДИ	p
Fever + lumbar pain: Yes No	 30 (29.1) 73 (70.9)	 1 (1.0) 102 (99.0)	 31 (15.0) 175 (85.0)	 41.92 (7.59–872.1) –	 0.000 –
Increased urinary frequency: Yes No	 21 (20.4) 82 (79.6)	 1 (1.0) 102 (99.0)	 22 (10.7) 184 (89.3)	 26.12 (4.63–550.67) –	 0.000 –
Dysuria: Yes No	 16 (15.5) 87 (84.5)	 1 (1.0) 102 (99.0)	 17 (8.3) 189 (91.7)	 18.76 (3.24–400.82) –	 0.000 –
Burning sensation: Yes No	 77 (74.8) 25 (24.3)	 66 (64.1) 36 (35)	 143 (69.4) 61 (29.6)	 1.66 (0.91–3.04) 0.6 (0.32–1.1)	 0.070 0.060
Hematuria: Yes No	 3 (2.9) 100 (97.1)	 0 (0) 103 (100.0)	 3 (1.5) 203 (98.5)	– – –	 0.120 –
Other symptoms: Yes No	 11 (10.7) 92 (89.3)	 0 (0) 103 (100.0)	 11 (5.3) 195 (94.7)	– – –	 0.000 –

Note: *OR – Odds Ratio; CI – Confidence interval; SD – Standard deviation.*

Примечание: *OR – отношение шансов; CI – доверительный интервал; SD – стандартное отклонение.*

Discussion / Обсуждение

The aim of this study was to determine the prevalence and associated risk factors of UTI in pregnancy at the Douala General Hospital. The prevalence of UTI found in this study was 4.41 % and risk factors independently associated with UTI in pregnancy were: a history of gestational diabetes mellitus, having sexual intercourse ≥ 3 times per week, a history of UTI, poor vaginal toileting technique, use of chlorhexidine for vaginal douching, and drying the genital organs from back to front.

Prevalence of urinary tract infection in pregnancy / Распространенность инфекции мочевыводящих путей у беременных

The prevalence of UTI at the obstetrical wards of the Douala General Hospital during the period was 4.41 %. This was consistent with the 4.3 % reported by Haider et al. [8] and almost similar to the 7.3 % of significant bacteriuria reported in another study [12]. However, this is lower than the 26 % and 23.5 % reported by Taye et al., 2018 and Mohamed et al., 2017, respectively [7, 10]. The prevalence of asymptomatic bacteriuria (ASB) in our study was 2.6 %. The prevalence of ASB in this study is much lower than that reported in the literature; Radha et al. reported 8.25 % [13], Mohamed Abdel-Aziz et al. – 10 % [14] and a systematic review conducted in Iran reported that 13 % of pregnant women in Iran had ASB (OR = 0.13; 95 % CI = 0.09–0.17) with a disparity between the northern and southern regions of Iran [15]. A study in the Buea Health District (Cameroon) reported a prevalence of bacteriuria of 23.5 % with a 7.8 % ASB [16]. This disparity may be explained by the fact that the DGH is a tertiary care health facility in Cameroon and most patients who benefit from the services offered by this hospital are either of high income or have health insurance coverage. Women from lower socio-economic backgrounds usually seek care from the primary or secondary care centers and only come to the DGH for referral in case of complications or severity of the case. Besides, ASB is a precursor of UTI and the difference in prevalence of UTI may be due to a difference in the socioeconomic, cultural, religious factors including body hygiene and sexual habits. This corroborates with other studies [8, 14, 17].

Risk factors of urinary tract infection / Факторы риска инфекции мочевыводящих путей

After multiple logistic regression analysis women with low antenatal care (ANC) uptake were more likely to develop UTI during pregnancy (AOR = 5.64; CI = 2.21–14.33; p = 0.000). This could be explained by the fact that majority of our study participants were multiparous women who believed they had a good knowledge of pregnancy progression from their experiences from previous pregnancies therefore they did not attend ANC services as required even when there is a need for it. Furthermore, our study population comprised mostly of workers (civil servants and those working in multinational companies) who may not attend ANC visits appropriately because of work pressure.

A frequency of sexual intercourse of greater or equal 3

Table 3. Reproductive health factors associated with urinary tract infection in study population (bivariate analysis).

Таблица 3. Факторы репродуктивного здоровья, связанные с инфекцией мочевыводящих путей в исследуемой популяции (бивариантный анализ).

Variable Показатель	Cases Случай (n = 103) n (%)	Controls Контроль (n = 103) n (%)	Total Всего (n = 206) n (%)	OR (95 % CI) ОШ 95 % ДИ	p
Gravidity:					
1	16 (15.5)	23 (22.3)	39 (18.9)	0.64 (0.31–1.3)	0.140
2–4	62 (60.2)	67 (65.0)	129 (62.6)	0.81 (0.46–1.43)	0.28
≥ 5	24 (23.3)	13 (12.6)	37 (18.0)	1.23 (0.7–2.17)	0.280
Mean ± SD	3.16 ± 1.60	2.76 ± 1.45	–	–	0.329
Parity:					
Nulliparous	18 (32.0)	42 (40.8)	60 (36.4)	0.68 (0.39–1.22)	0.120
Primiparous	28 (27.2)	23 (22.3)	51 (24.8)	1.3 (0.69–2.47)	0.260
Multiparous	56 (39.8)	36 (35.0)	92 (37.4)	2.1 (1.0–4.51)	0.030
Grand-multiparous	1 (1.0)	2 (1.9)	3 (1.5)	0.5 (0.02–6.62)	0.060
Prematurity:					
0	94 (91.3)	97 (94.2)	191 (92.7)	0.65 (0.21–1.91)	0.300
≥ 1	9 (8.7)	6 (5.8)	15 (7.3)	1.55 (0.52–4.83)	0.300
Mean ± SD	0.11 ± 0.40	0.05 ± 0.23	–	–	0.000
Number of abortion:					
< 3	95 (92.2)	99 (96.1)	194 (94.2)	0.48 (0.12–1.65)	0.190
≥ 3	7 (6.8)	4 (3.9)	11 (5.3)	1.8 (0.51–7.22)	0.270
Mean ± SD	0.82 ± 1.00	0.52 ± 0.83	–	–	0.063
Number of children alive:					
< 3	90 (87.4)	91 (88.3)	181 (87.9)	0.91 (0.39–2.14)	0.500
≥ 3	12 (11.7)	11 (10.7)	23 (11.2)	1.1 (0.46–2.69)	0.500
Mean ± SD	1.24 ± 1.09	1.05 ± 1.19	–	–	0.387
ANC by Obstetrician	100 (97.1)	103 (100.0)	203 (98.5)	0 (0.0–1.7)	0.120
ANC by Resident	3 (2.9)	0 (0)	3 (1.5)	–	0.120
Number of ANC:					
≤ 4	26 (25.2)	4 (3.9)	30 (14.6)	8.36 (2.95–28.82)	0.000
5–7	53 (51.5)	47 (45.6)	100 (48.5)	1.26 (0.73–2.19)	0.240
≥ 8	24 (23.3)	52 (50.5)	76 (36.9)	0.3 (0.16–0.54)	0.000
Mean ± SD	5.84 ± 1.02	7.31 ± 1.86	–	–	0.403
Number of fetuses:					
1	99 (96.1)	102 (99.0)	201 (97.6)	0.24 (0.01–1.98)	0.180
> 1	4 (3.9)	0 (0)	4 (1.9)	–	0.060
Gestational diabetes mellitus:					
Yes	11 (10.7)	2 (1.9)	13 (6.3)	6.0(1.4-40.73)	0.020
No	92 (89.3)	101 (98.1)	193 (93.7)	–	–
Hypertension in pregnancy:					
Yes	4 (3.9)	1 (1)	5 (2.4)	4.12 (0.5–102.89)	0.060
No	99 (96.1)	102 (99)	201 (97.6)	–	–
Frequency of sexual intercourse (per week):					
< 1	10 (9.7)	17 (16.5)	27 (13.1)	0.54 (0.23–1.25)	0.110
1–2	58 (56.3)	71 (68.9)	129 (62.6)	0.58 (0.33–1.03)	0.040
≥ 3	35 (34)	15 (14.6)	50 (24.3)	3.02 (1.53–6.08)	0.000
Mean ± SD	1.88 ± 1.15	1.28 ± 0.95	–	–	0.052

Note: *OR – Odds Ratio; CI – Confidence interval; SD – Standard deviation.*

Примечание: *OR – отношение шансов; CI – доверительный интервал; SD – стандартное отклонение.*

times per week was independently associated with UTI in pregnancy in this study (AOR = 3.44; 95 % CI = 1.24–9.57). This result is consistent with the reports of Mohamed et al., 2017 (OR = 1.36; 95 % CI = 0.75–2.43), Elzayat et al., 2017 (OR = 14; 95 % CI = 1.44–5.6), Emiru et al., 2015 (OR = 3.52; 95 % CI = 1.19–10.36), Haider et al., 2010 (OR = 1.15; 95 % CI = 0.02–1.26) [3, 7, 8, 14]. The association between sexual intercourse and subsequent acute symptomatic urinary tract infection in women is so well known that these episodes are often labeled "honey-moon cystitis". Besides, during sexual intercourse they may be micro-trauma of the urinary apparatus (urethra and bladder) and bacteria found in the urine may easily cause a UTI. This has previously been reported as the so-called

2020 • Vol. 14 • № 4
Obstetrics, Gynecology and Reproduction

honey-moon cystitis [18, 19]. Because recurrent urinary-tract infection in women is a perplexing problem for both doctor and patient, various measures have been proposed to prevent recurrences, ranging from scrubbing the perineum before intercourse to emptying the bladder soon after [17]. The effectiveness of such methods has not been documented.

A history of UTI was independently associated with UTI in pregnancy in this study (AOR = 3.011; 95 % CI = 1.12–8.0). This is consistent with previous reports by Gessese et al., 2017 (OR = 2.29; 95 % CI = 1.15–4.56), Haider et al., 2010 (OR = 15.07; 95 % CI = 1.87–121.1; p = 0.000), Amiru et al., 2013 (OR = 3.39; 95 % CI = 1.67–6.90) [3, 8, 20]. This may be explained by the fact that there are high rates of self-medication in Douala and most regions of Cameroon. This is compounded with the numerous ambulatory drug sellers and prescription of antibiotics by both medical and non-medical caregivers without antimicrobial susceptibility testing. This may either cause antimicrobial drug resistance and poor treatment of impending infection. One study has identified *Escherichia coli* as the most common pathogen of UTI and among these, 90 % isolates were resistant against ampicilin. Present studies also showed that 60–79 % isolates were resistant against chloramphenicol, erythromycin, rifampicin, sulphamathizole, and tetracycline. Norfloxacin showed intermediate resistance. The most effective antibiotics against *Escherichia coli* in the study were kanamycin and streptomycin [21].

Gestational diabetes mellitus was also significantly associated with UTI in this study (AOR = 6.04; 95 % CI = 1.44–40.73). This is consistent to studies reported by Easter et al., 2016 (OR = 3.2; 95 % CI = 2.11–35.12) [22]. However, this is not consistent with that reported by Taye et al. (OR = 0.70; 95 % CI = 0.14–3.41) [10]. This contradiction

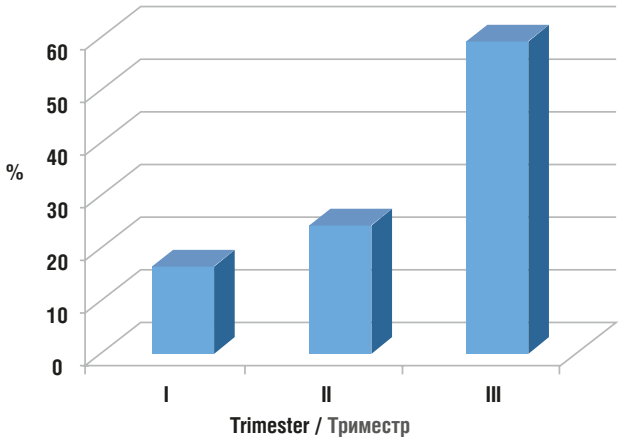

Figure 2. Distribution of urinary tract infection according to trimester of pregnancy.

Рисунок 2. Распределение заболеваемости инфекцией мочевыводящих путей по триместрам.

may be due to the fact that our study was carried out in a low-income setting where follow-up of pregnant diabetic women is not optimal because of limited resources and poor compliance to treatment.

In this study, we found that vaginal douching, the use of chlorhexidine for vaginal douching, the direction of washing and drying the genitals especially when done from back to front were significantly associated with UTI in pregnancy (AOR = 2.36; 95 % CI = 1.33–3.06). This is similar to the results found by Shaheen et al., 2016, Mohamed et al., 2017, and Elzayat et al., 2017 [6, 7, 14]. Anatomically, the female urethra is very short. Furthermore, the distance between the anus and vaginal fourchette is also very short (about 2 cm). Therefore, any errors in the technique of vulva douching and cleansing/drying may easily contaminate the

Table 4. Medical history of study population.

Таблица 4. Анамнез обследованных пациентов.

Variable Показатель	Cases Случай (n = 103) n (%)	Controls Контроль (n = 103) n (%)	Total Всего (n = 206) n (%)	OR (95 % CI) ОШ 95 % ДИ	p
HIV positive:					
Yes	3 (2.9)	0 (0)	3 (1.5)	–	0.120
No	100 (97.1)	103 (100)	203 (98.5)	–	–
Urinary malformation:					
Yes	1 (1)	0 (0)	1 (0.5)	–	0.500
No	102 (99)	103 (100)	205 (99.5)		
Kidney failure:					
Yes	1 (1)	0 (0)	1 (0.5)	–	0.500
No	102 (99)	103 (100)	205 (99.5)	–	–
Past urinary tract infection:					
Yes	74 (57.3)	30 (43.7)	104 (50.5)	1.73 (1.993–2.1)	0.030
No	44 (42.7)	58 (56.3)	102 (49.5)	–	–

Note: *OR – Odds Ratio; CI – Confidence interval; SD – Standard deviation; HIV – Human immunodeficiency virus.*

Примечание: *OR – отношение шансов; CI – доверительный интервал; SD – стандартное отклонение; HIV – вирус иммунодефицита человека.*

Table 5. Hygienic factors associated with urinary tract infection in study population (bivariate analysis).

Таблица 5. Гигиенические факторы, связанные с инфекцией мочевыводящих путей в исследуемой популяции (бивариантный анализ).

Variable Показатель	Cases Случай (n = 103) n (%)	Controls Контроль (n = 103) n (%)	Total Всего (n = 206) n (%)	OR (95 % CI) ОШ 95 % ДИ	p
Vaginal toileting:					
Yes	55 (53.4)	22 (21.4)	77 (37.4)	4.22 (2.29–7.82)	0.000
No	48 (46.6)	81 (78.6)	129 (62.6)	–	–
Number of vaginal toilet (per day):					
1–2	40 (38.8)	20 (19.4)	60 (29.1)	2.63 (1.40–4.99)	0.000
> 2	14 (13.6)	2 (1.9)	16 (7.8)	7.94 (1.97–52.43)	0.000
Product used for the toilet:					
Ordinary soap	13 (12.6)	9 (8.7)	22 (10.7)	1.51 (0.61–3.84)	0.250
Chlorhexidine	44 (42.7)	15 (14.6)	59 (28.6)	4.38 (2.24–8.72)	0.000
Genital organ dryness:					
Wiping from back to front	50 (48.5)	22 (21.4)	72 (35.0)	3.47 (1.89–6.44)	0.000
Wiping from front to back	25 (24.3)	68 (66.0)	93 (45.1)	0.17 (0.09–0.3)	0.000
Type of toilet at home:					
Traditional toilet	16 (15.5)	22 (21.4)	38 (18.4)	0.68 (0.33–1.38)	0.180
Modern toilet	87 (84.5)	81 (78.6)	168 (81.6)	1.48 (0.72–3.05)	0.180
Number of person using the toilet at home:					
< 3	32 (31.1)	47 (45.6)	79 (38.3)	0.54 (0.3–0.95)	0.020
3–4	47 (45.6)	50 (48.5)	97 (47.1)	0.89 (0.51–1.54)	0.390
> 4	22 (21.4)	6 (5.8)	28 (13.6)	4.39 (1.74–12.29)	0.000
Mean ± SD	3.38 ± 1.38	2.70 ± 1.08	–	–	0.013

Note: *OR – Odds Ratio; CI – Confidence interval; SD – Standard deviation.*

Примечание: *OR – отношение шансов; CI – доверительный интервал; SD – стандартное отклонение.*

Table 6. Risk factors of urinary tract infection (multivariate analysis).

Таблица 6. Факторы риска инфекции мочевыводящих путей (мультивариантный анализ).

Variable Показатель	Adjusted OR Скорректированное ОШ	95 % CI 95 % ДИ	p
Antenatal care < 4	5.6	2.2–14.3	0.0003
History of gestational diabetes mellitus	4.6	0.2–96.9	0.02
Frequency of sexual intercourse ≥ 3 times/week	3.4	1.2–9.6	0.018
History of urinary tract infection	3.01	1.10–8.04	0.03
Vaginal douching	2.4	1.3–3.1	0.01
Chlorhexidine use for vaginal douching	2.7	1.2–4.3	0.03
Drying the genital organs from back to front	5.5	1.95–15.40	0.001
> 4 persons using a toilet	0.90	0.18–4.40	0.9

Note: *OR – Odds Ratio; CI – Confidence interval.*

Примечание: *OR – отношение шансов; CI – доверительный интервал.*

urethra with microorganisms from the anus. Besides, the use of chlorhexidine for vaginal douching may alter the vaginal flora and increase the risk of infections like Bacterial vaginosis that will subsequently be transferred to the urinary system. The average family size in Cameroon is about 6 persons (parents inclusive). The more people you have in a home, the more difficult it becomes to handle the hygienic conditions of the toilettes. Therefore, some pregnant women may become contaminated from the toilette seats (poor hygiene) that had not been cleaned. Other studies have reported that rates of UTI were higher in those with a low family income, of large family size (10+) and living in over-crowded conditions [23].

Study limitations and strengths of study / Ограничения и сильные стороны исследования

A good number of files of UTI had incomplete data, thereby excluding them from the analysis. Furthermore, our study was hospital-based, and UTI in pregnancy that occurred in other centres could not be included since these may not be reported. This could hide the true picture of the burden of UTI in pregnancy in Cameroon.

Majority of the respondents had a urine culture done. This enabled us to identify the microbe causing the UTI as well as their frequency. All women who gave birth at the DGH came back 6 weeks later for postnatal checks.

This permitted us to identify complications both in the mother and neonate.

Conclusion / Заключение

The prevalence of UTI in pregnancy at the Douala General Hospital is low. The factors independently associated with UTI in pregnancy were: low antenatal care uptake ≤ 4 times, a history of gestational diabetes mellitus, frequency of sexual intercourse ≥ 3 times per week, a history of UTI, use of chlorhexidine for vaginal douching and direction of washing/drying the genitals organs from back to front. We recommend that screening for UTI in pregnancy should be made standard of obstetric care in Cameroon.

ARTICLE INFORMATION	ИНФОРМАЦИЯ О СТАТЬЕ
Received: 30.04.2020. **Revision received:** 17.08.2020.	**Поступила:** 30.04.2020. **В доработанном виде:** 17.08.2020.
Accepted: 07.09.2020. **Published:** 20.09.2020.	**Принята к печати:** 07.09.2020. **Опубликована:** 20.09.2020.
Author's contribution	**Вклад авторов**
All authors participated equally in the collection, analysis and interpretation of the data.	Все авторы принимали равное участие в сборе, анализе и интерпретации данных.
All authors have read and approved the final version of the manuscript.	Все авторы прочитали и утвердили окончательный вариант рукописи.
Conflict of interests	**Конфликт интересов**
The authors declare no conflict of interest.	Авторы заявляют об отсутствии конфликта интересов.
Funding	**Финансирование**
The authors received no financial support for the research, authorship, and/or publication of this article.	Авторы не получали финансовой поддержки на исследование, написание и/или публикацию данной статьи.
Acknowledgements	**Благодарности**
We are grateful to the patients who responded to our telephone calls to complete the data collection.	Мы благодарим пациентов, принявших участие в нашем телефонном опросе с целью сбора полных данных для исследования.
Patient consent	**Согласие пациентов**
We obtained verbal consent by phone from study participants.	От участников исследования было получено устное согласие по телефону.
Ethics approval	**Одобрение этических норм**
Authorization was obtained from the Director General of the Douala General Hospital, Douala, Cameroon.	Получено одобрение от Генерального директора многопрофильного госпиталя Дуалы, Дуала, Камерун.
Clinical Trials Disclosure Policy	**Политика раскрытия данных клинических исследований**
Data are available on reasonable request. The request should be directed to toegbe@gmail.com. To gain access, data requestors will need to sign a data access agreement	Данные доступны по обоснованному запросу. Запросы должны быть направлены на почтовый ящик toegbe@gmail.com. Чтобы получить доступ, лица, запрашивающие данные, должны будут подписать соглашение о доступе к данным.
Provenance and peer review	**Происхождение статьи и рецензирование**
Not commissioned; externally peer reviewed.	Журнал не заказывал статью; внешнее рецензирование.

References / Литература:

1. Lee A.C., Mullany L.C., Koffi A.K. et al. Urinary tract infections in pregnancy in a rural population of Bangladesh: population-based prevalence, risk factors, etiology, and antibiotic resistance. *BMC Pregnancy Childbirth*. 2020;20(1):1. https://doi.org/10.1186/s12884-019-2665-0.
2. Matuszkiewicz-Rowińska J., Malyszko J., Wieliczko M. Urinary tract infections in pregnancy: old and new unresolved diagnostic and therapeutic problems. *Arch Med Sci*. 2015;11(1):67–77. https://doi.org/10.5114/aoms.2013.39202.
3. Amiri M., Lavasani Z., Norouzirad R. et al. Prevalence of urinary tract infection among pregnant women and its complications in their newborns during the birth in the hospitals of Dezful City, Iran, 2012–2013. *Iran Red Crescent Med J*. 2015;17(8):e26946. https://doi.org/10.5812/ircmj.26946.
4. Kant S., Lohiya A., Kapil A., Gupta S.K. Urinary tract infection among pregnant women at a secondary level hospital in Northern India. *Indian J Public Health*. 2017;61(2):118–23. https://doi.org/10.4103/ijph.IJPH_293_15.
5. Masinde A., Gumodoka B., Kilonzo A., Mshana S.E. Prevalence of urinary tract infection among pregnant women at Bugando Medical Centre, Mwanza, *Tanzania*. *Tanzan J Health Res*. 2009;11(3):154–9. https://doi.org/10.4314/thrb.v11i3.47704.
6. Shaheen H.M., Farahat T.M., El-Hakeem Hammad N.A. Prevalence of urinary tract infection among pregnant women and possible risk factors. *Menoufia Med J*. 2016;29(4):1055–9.
7. Mohamed N.R., Omar H.H., Abdallah I.M. Prevalence and risk factors of urinary tract infection among pregnant women in Ismailia City, Egypt. *IOSR-JNHS*. 2017;6(3):62–72. https://doi.org/10.9790/1959-0603076272.
8. Haider G., Zehra N., Munir A.A., Haider A. Risk factors of urinary tract infection in pregnancy. *JPMA J Pak Med Assoc*. 2010;60(3):213–6.
9. Abbas N., Javaid R., Gul S. Prevalence of asymptomatic bacteriuria in pregnancy. *JIMDC*. 2017;6(2):162–5.
10. Taye S., Getachew M,. Desalegn Z. et al. Bacterial profile, antibiotic susceptibility pattern and associated factors among pregnant women with Urinary Tract Infection in Goba and Sinana Woredas, Bale Zone, Southeast Ethiopia. *BMC Res Notes*. 2018;11(1):799. https://doi.org/10.1186/s13104-018-3910-8.
11. Beksac A.T., Orgul G., Tanacan A. et al. Uropathogens and gestational outcomes of urinary tract infections in pregnancies that necessitate hospitalization. *Curr Urol*. 2019;13(2):70–3. https://doi.org/10.1159/000499290.
12. Sujatha R., Nawani M. Prevalence of asymptomatic bacteriuria and its antibacterial susceptibility pattern among pregnant women attending the antenatal clinic at Kanpur, India. *J Clin Diagn Res*. 2014;8(4):DC01–3. https://doi.org/10.7860/JCDR/2014/6599.4205.
13. Radha S., Nambisan B., Prabhakaran N.K., Jamal S. Prevalence and outcome of asymptomatic bacteriuria in early pregnancy. *Inter J Reprod Contracept Obstet Gynecol*. 2017;6(1):223–7. https://doi.org/10.18203/2320-1770.ijrcog20164663.

14. Elzayat M.A.-A., Barnett-Vanes A., Dabour M.F.E., Cheng F. Prevalence of undiagnosed asymptomatic bacteriuria and associated risk factors during pregnancy: a cross-sectional study at two tertiary centres in Cairo, Egypt. *BMJ Open*. 2017;7(3):e013198. https://doi.org/10.1136/bmjopen-2016-013198.
15. Ghafari M., Baigi V., Cheraghi Z., Doosti-Irani A. The prevalence of asymptomatic bacteriuria in Iranian pregnant women: a systematic review and meta-analysis. *PloS One*. 2016;11(6):e0158031. https://doi.org/10.1371/journal.pone.0158031.
16. Mokube M.N., Atashili J., Halle-Ekane G.E. et al. Bacteriuria amongst pregnant women in the Buea Health District, Cameroon: prevalence, predictors, antibiotic susceptibility patterns and diagnosis. *PloS One*. 2013;8(8):e71086. https://doi.org/10.1371/journal.pone.0071086.
17. Ghouri F., Hollywood A., Ryan K. A systematic review of non-antibiotic measures for the prevention of urinary tract infections in pregnancy. *BMC Pregnancy Childbirth*. 2018;18(1):99. https://doi.org/10.1186/s12884-018-1732-2.
18. Kantha S.S. Medical maladies during the honeymoon: a review. *Int Med J*. 2014;21(3):335–7.
19. Macklin M. Honeymoon cystitis. *N Engl J Med*. 1978;298(18):1035. https://doi.org/10.1056/NEJM197805042981826.
20. Gessese Y.A., Damessa D.L., Amare M.M. et al. Urinary pathogenic bacterial profile, antibiogram of isolates and associated risk factors among pregnant women in Ambo town, Central Ethiopia: a cross-sectional study. *Antimicrob Resist Infect Control*. 2017;6:132. https://doi.org/10.1186/s13756-017-0289-6.
21. Khan A.U., Zaman M.S. Multiple drug resistance pattern in Urinary Tract Infection patients in Aligarh. *Biomedical Research*. 2006;17(3): 179–81.
22. Easter S.R., Cantonwine D.E., Zera C.A. et al. Urinary tract infection during pregnancy, angiogenic factor profiles, and risk of preeclampsia. *Am J Obstet Gynecol*. 2016;214(3):387–e1. https://doi.org/10.1016/j.ajog.2015.09.101.
23. al-Sibai M.H., Saha A., Rasheed P. Socio-biological correlates of bacteruria in Saudi pregnant women. *Public Health*. 1989;103(2):113–21. https://doi.org/10.1016/s0033-3506(89)80025-3.

About the authors:
Wague Wague Christiane Dayas Francine – MD, Faculty of Health Sciences, University of Bamenda, Cameroon.
Theophile Nana-Njamen – MD, Faculty of Health sciences, University of Buea, Buea, Cameroon; Department of Obstetrics and Gynecology, Douala General Hospital, Douala, Cameroon.
Njimanted Omarine – MD, Faculty of Health Sciences, University of Bamenda, Bamenda, Cameroon.
Doretta Nzele Egbe – MD, Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Douala, Cameroon.
George Enonchong Enow-Orock – MD, Department of Pathology, Faculty of Health Sciences, University of Buea, Buea, Cameroon.
Thomas Obinchemti Egbe – MD, Faculty of Health Sciences, University of Buea, Buea, Cameroon; Department of Obstetrics and Gynecology, Douala General Hospital, Douala, Cameroon. E-mail: toegbe@gmail.com; obinchemti@yahoo.com.

Сведения об авторах:
Дайас Франсин Ваг Ваг Кристиан – факультет медицинских наук, Университет Баменды, Камерун.
Нана-Нджамен Теофил – факультет медицинских наук, Университет Буэа, Буэа, Камерун; отделение акушерства и гинекологии, Больница общего профиля, Дуала, Камерун.
Омарин Нжимантед – факультет медицинских наук, Университет Баменда, Баменда, Камерун.
Эгбе Доретта Нзеле – факультет медицины и фармацевтических наук, Университет Дуала, Дуала, Камерун.
Знов-Орок Джордж Энончонг – кафедра патологии, факультет медицинских наук, Университет Буэа, Буэа, Камерун.
Эгбе Томас Обинчемти – факультет медицинских наук, Университет Буэа, Буэа, Камерун; отделение акушерства и гинекологии, Больница общего профиля, Дуала, Камерун. E-mail: toegbe@gmail.com; obinchemti@yahoo.com.