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Prevalence of urinary tract infections among pregnant women at Sohag University Hospital

Mona A.D. Mahmoud^a, Amel D. Kamel^b, Safaa I. Ahmed^a, Azza A.A. El-Hamed^b

^aDepartment of Obstetrics and Gynecology Nursing, Faculty of Nursing, Sohag University, Sohag, ^bDepartment of Maternal and Newborn Health Nursing, Faculty of Nursing, Cairo University, Cairo, Egypt

Correspondence to Mona A.-D. Mahmoud, (+93), BSc, Department of Obstetrics & Gynecology and Reproductive Health Nursing, Faculty of Nursing, Sohag University, Sohag, Egypt. Tel: +20 106 330 1708; e-mail: monaaldeeb505@yahoo.com

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Background

Urinary tract infections (UTIs) are among the most common bacterial infections that affect pregnant women, which if left untreated can lead to perinatal morbidity and mortality.

Aim

The study aimed to assess the prevalence of UTIs among pregnant women.

Participants and methods

A descriptive/exploratory design was adopted. The study was conducted at the Obstetrics and Gynecology Outpatient Clinic of Sohag University Hospital. A convenience sample of 440 pregnant women, irrespective of age, parity, or gestational age, was recruited for the study. Three tools were used to collect data: first, structured interviewing schedule; second, UTI symptomatology tool; and third, laboratory investigation record. The research investigator developed the structured interviewing schedule and UTI symptomatology tool.

Results

The study results indicated that the mean age of the pregnant women was 22.8±6.2 years. Overall, 37.3% of the pregnant women had secondary education, 75.7% were living in rural area, and 87.3% were housewives. Moreover, 46.3% of the pregnant women were multigravida, whereas 51.6% of them were multiparous. The prevalence of UTIs among the pregnant women was 42.3%. The types of UTIs isolated were symptomatic UTI diagnosed in 59% and asymptomatic UTI was identified in 41% among pregnant women who had UTIs. The prevalence of symptomatic UTIs and asymptomatic UTI among the total pregnant women was 25 and 17.3%, respectively. Synthetic underwear, decreasing fluid intake, multigravida, occupation, and educational level were risk factors that might affect the incidence of UTIs.

Conclusion

The prevalence of UTIs among pregnant women was high. Overall, 41% of pregnant women who had UTIs were asymptomatic. Synthetic underwear, decreasing fluid intake, multigravida, occupation, and educational level were risk factors that might affect the incidence of UTIs.

Recommendation

It is important to do routine urine analysis for all pregnant women on every visit.

Keywords:

asymptomatic urinary tract infections, pregnancy, prevalence, symptomatic

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Introduction

Urinary tract infections (UTIs) are among the most common bacterial infections that affect the urinary tract. They are common, affect men and women of all ages, and vary dramatically in their presentation and sequelae. In the USA, they are responsible for 8.6 million health care visits and an estimated cost of 1.6 billion dollars each year. In pregnancy, UTIs are one of the most common medical complications that affect ~13–33% of pregnant women worldwide. They are also accountable for 10% of all admissions to hospital during pregnancy in general (Foxman, 2014; Fatima and Al Mussaed, 2018).

UTIs are the second common health problems among pregnant women 'after anemia' (Amiri *et al.*, 2015). In Egypt, Mohammad (2013) conducted a study of frequency and risk factors of UTIs among pregnant women in Suez Governorate and revealed that the frequency of UTIs during pregnancy was 30.29%. Altaf *et al.* (2017) conducted a study of incidence of UTIs among antenatal patients in India and reported that the incidence of UTIs in pregnant women was

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30%. Moreover, Onyango *et al.* (2018) conducted a study of UTIs among pregnant women at Nairobi, Kenya and revealed that the prevalence of UTIs in pregnant women was 15.7% regardless of the women's age, parity, and gestation.

At the same time, pregnant women are at increased risk for UTIs, beginning at week 6 and peaking during weeks 22–26, owing to the anatomical and physiological changes that occur during pregnancy, which increase the liability to UTI. Relaxation of ureteric smooth muscle by progesterone predisposes to upper urinary tract dilation, and bladder displacement superiorly and anteriorly by the growing uterus can also lead to bladder emptying impairment, thereby stasis of urine; moreover, the increased condensation of glucose and amino acids found in urine during pregnancy increases the possibility of UTIs. In addition, an already short urethra (~3–4 cm in females) and difficulty with hygiene owing to a distended pregnant belly increase the risk for bacterial infections during pregnancy (Johnson, 2017).

In pregnancy, UTIs include two groups: asymptomatic bacteriuria (ASB) and symptomatic bacteriuria. ASB is defined as the persistent presence of bacteriuria within the urinary tract of women who have no symptoms. Jain *et al.* (2013) conducted a prospective cohort study in India, which revealed that the prevalence of ASB was 17% in early pregnancy and 16% in the third trimester. Baker *et al.* (2015) reported that the prevalence of ASB is doubled in pregnancy to 2–15%, and if left untreated, ~40% of those infected will develop an acute symptomatic UTIs. Moreover, a systematic review and meta-analysis conducted by Ghafari *et al.* (2016) among Iranian pregnant women revealed that the overall prevalence of ASB was 13%. Consequences of neglected ASB can be significant, including elevated risk of pyelonephritis, premature labor, fetal death, and pregnancy-induced hypertension.

Symptomatic bacteriuria includes cystitis and pyelonephritis. Cystitis is an infection of the bladder, in which, there are symptoms of local infection that include frequency, dysuria, urgency, suprapubic pain, and hematuria besides presences of significant bacteriuria. Cystitis occurs in ~1–4% of pregnancies. Pyelonephritis is an infection of the parenchyma of the kidney, in which there are symptoms of chills, fever, flank pain, vomiting, malaise, and back pain markedly in the costovertebral angle in addition to significant

bacteriuria. Pyelonephritis occurs in 0.5–2% of pregnant women (Johnston *et al.*, 2017; Lowder *et al.*, 2014). A study conducted by Ranjan *et al.* (2017) reported that the prevalence rate of UTIs among pregnant women in Bhimavaram was 35%. Moreover, a study conducted by Yasmin *et al.* (2018) revealed that the prevalence rate of UTIs among pregnant women in Katihar district, Bihar, was 28%.

Moreover, risk factors of bacteriuria during pregnancy rise with parity, low socioeconomic status, sexual activity, diabetes mellitus, chronic urinary retention, sickle-cell trait or disease, previous UTIs history, neuromuscular dysfunction bladder, structural disorders of urinary tract, renal stones, and catheterization (Cibulka *et al.*, 2017). UTIs can lead to serious obstetric complications, including poor maternal and fetal outcomes such as anemia, preeclampsia, renal failure, septicemia, intrauterine growth retardation, acute respiratory distress, and prematurity (Lawani *et al.*, 2015; Willy *et al.*, 2015). A study conducted by Amiri *et al.* (2015) regarding the prevalence of UTI among pregnant women and its complications in their newborns during the birth in the hospitals of Dezful city, Iran, 2012–2013, revealed that weight and height of newborn infants of mothers with UTIs were significantly lower compared with newborns of healthy women, so it is important to reduce the risk of infection and complications in pregnant women by creating awareness regarding the causes and symptoms of UTIs and prevention of the factors causing it, especially by educating women before and during pregnancy.

A systematic review conducted by Schmiemann *et al.* (2010) reported that the clinical diagnosis of the UTIs is essentially based on the medical history. Urine testing is the second important element in diagnosis. Urine dip sticks are one of the most frequently used instruments for diagnostic testing if there is clinical evidence that a patient has UTIs, which may be able to detect nitrite, leukocyte esterase, protein, and blood.

In Egypt, a national study on a wide scale should be conducted to identify the group that is vulnerable to developing UTIs, especially in the obstetric community. Most of the research studies have examined many issues of UTIs among pregnant women such as the prevalence and risk factors, but the studies have not covered the Upper Egypt. Therefore, the aim of the proposed study is to assess the prevalence of symptomatic and asymptomatic UTIs among pregnant women at Sohag University Hospital.

Significance of the study

UTIs during pregnancy are among the most prevalent health problems worldwide, especially in developing countries (Baker *et al.*, 2015). In Egypt, Shaheen *et al.* (2016) carried out a case-control study of prevalence of UTIs among pregnant women and possible risk factors at Menoufia Governorate. This study revealed that the frequency of UTIs during pregnancy was 32%. Elzayat *et al.* (2017) conducted a cross-sectional study of prevalence of undiagnosed ASB and associated risk factors during pregnancy at two tertiary centers in Cairo, Egypt. The study revealed that the prevalence of ASB in pregnant women was 10%. Moreover, a study conducted by Mohamed *et al.* (2017) studied the prevalence and risk factors of UTIs among pregnant women at Ismailia city and revealed that 29% of the studied women had UTIs. Through the clinical experience, it was observed that UTIs are the most common reasons for seeking medical care when the symptoms are aggravating. The long ignored ASB in pregnancy may result in serious complications, including development of acute pyelonephritis. Acute pyelonephritis carries significant risks in pregnancy, including septicemia, anemia, transient renal dysfunction, preterm labor, intrauterine growth restriction, premature rupture of membranes, and preeclampsia. So, an early detection and treatment of UTIs may be of importance to avoid complications for pregnant women and reduce prematurity and fetal mortality (Matuszkiewicz-Rowinska *et al.*, 2013; Yadav *et al.*, 2014; Chu and Lowder, 2018).

The nurses and health care providers play a vital role in antenatal screening programs in antenatal clinics, which helps in the assessment of the incidence of UTIs among pregnant women; this will add to the knowledge base and help in early detection and prevention. Therefore, the proposed study includes the prevalence of symptomatic and asymptomatic UTIs among pregnant women at Sohag university hospital.

Aim

The aim of this study was to assess the prevalence of UTIs among pregnant women.

Research questions

- (1) What is the prevalence of UTIs among pregnant women?
- (2) What are the prevalence of symptomatic and asymptomatic UTIs among pregnant women?

- (3) What are risk factors that might increase the incidence of UTIs among the pregnant women?

Participants and methods

Research design

This study adopted a descriptive/exploratory design to assess the prevalence of symptomatic and asymptomatic UTIs during pregnancy. This design helps the research investigator to explore and collect detailed descriptions of existing variables and use the data to justify and assess current condition. It provides a picture of the phenomenon as it naturally occurs (Polit and Beck, 2014).

Setting

This study was conducted at the Obstetrics and Gynecology Outpatient Clinic of Sohag University Hospital, which is a university-affiliated hospital, providing free health care services to outpatient gynecologic patients as well as obstetric patients. The total annual patient visits to the outpatient obstetrics and gynecology clinics were 4000 women (Statistical Department, 2018), and care is provided by obstetrician, as well as professional and diploma nurses who are responsible for giving nursing care.

Sample

A convenient sample of 440 pregnant women was recruited based on power analysis. A power of 0.95 ($\beta=1-0.95=0.05$) at α 0.05 (one-sided) with medium effect size of 0.3 was used as the significant level. Although the minimum number of 400 participants was recruited by power analysis, the research investigator included 440 participants in this study, taking into account 10% nonresponse rate, which would be excluded according to the inclusion criteria. All pregnant women irrespective of age, parity, or gestational age were included.

Tools for data collection

Three tools were used to collect data: first, structured interviewing schedule; second, UTI symptomatology tool; and third, laboratory investigation record. The research investigators developed a structured interviewing schedule and UTI symptomatology tool:

- (1) Structured interviewing schedule: this tool consisted of four parts: first, sociodemographic characteristics; second, reproductive history; third, medical and family history; and fourth, personal hygiene and habits. The first part comprised the sociodemographic characteristics, which included code, age, educational level, occupation, residence monthly

income, water supply, electricity, good ventilation, family size and type of sanitation, as well as husband's demographic data. The second part comprised reproductive history, which included gravidity, parity, abortion, gestational age, number of living children, previous use of contraceptive methods, type of previous delivery, regulatory antenatal follow-up, and previous history of UTIs with previous pregnancies. The third part comprised medical and family history of chronic disease such as diabetes, hypertension, anemia, renal disease, and allergy. The fourth part comprised personal hygiene and habits, which included the type of underwear, frequency of changing it, hand washing before and after toileting, perineal wiping practice after toileting, frequency of micturition, etc.

- (2) UTI symptomatology tool: it included data related to symptoms of UTIs reported by pregnant women such as presence of burning sensation or pain during urination, frequency, urgency, presence of suprapubic pain, sensation of itching, fever, nausea, and vomiting.
- (3) Laboratory investigation record: it included urinalysis record developed by hospital and included the following tests: red or white blood cells, pus cells, bacteria, protein, nitrites, color, aspect, reaction, specific gravity, pH, sugar, and epithelial cells, which can be seen as normal or abnormal, as well as diagnosis of UTI, where UTI was diagnosed based on the presence of pus cells, red blood cells, and the existence of nitrite and bacteria.

Tool validity

Tools were submitted to a panel of five experts in the field of obstetrics and maternity nursing to test the content validity. Modifications were carried out according to the panel judgment on clarity of sentences and the appropriateness of content.

Pilot study

A pilot study was conducted on 10% of the pregnant women to assess the feasibility and clarity of the tools and determine the needed time to complete the tools. Pregnant women included in the pilot study were excluded from the study sample.

Ethical considerations

A primary approval was granted by the Research Ethics Committee at the Faculty of Nursing, Cairo University, to perform this study. After that, the principal research investigator introduced herself to each pregnant women and explained the purpose of

the study and its importance. All pregnant women were informed that the study posed no risks or hazards for their health, their participation is voluntary, and they had the right to withdraw from the study at any time. Anonymity and confidentiality were assured through coding of the data. Then, for those who accepted to be participated in this study and met the inclusion criteria, an informed written consent was obtained from each one of them. Pregnant women were assured that data will not be reused in another research. After completion of data collection process, a final approval was taken from the same committee to proceed in the thesis completion (date).

Procedure

Interviewing step

The principal research investigator met the pregnant women who accepted to be participated in this study and were attending the antenatal clinic for follow-up to collect data related to sociodemographic characteristics, reproductive history, medical and family history, and personal hygiene and habits. The principal research investigator interviewed the pregnant women face to face and asked them questions in simple Arabic language. The interview took 10 min with each pregnant woman and then the principal research investigator documented the data on a structured interviewing schedule tool.

Assessment step

After collection of sociodemographic characteristics, the principal research investigator collected data from the pregnant women regarding their UTIs symptoms such as the presence of burning sensation or pain during urination, frequency, urgency, and presence of suprapubic pain, sensation of itching, fever, nausea, vomiting, etc. Moreover, the research investigator asked pregnant women about time since occurrence of these symptoms. The interview took 5 min with each pregnant woman and then the research investigator documented the data on UTI symptomatology tool.

The obstetrician requested the pregnant woman to make a complete urine observation and then the pregnant women were divided into symptomatic and asymptomatic UTIs by the research investigators based on the presence of UTIs symptoms. Diagnosis of UTI was based on the presence of pus cells, red blood cells, existence of nitrite, and bacteria.

Statistical design

Data management was done by coding and entering responses into a personal computer. The research

investigators checked all data to avoid any discrepancies. Data were examined for coding and entering error. Participants' collected data were stored using a Statistical Package for the Social Sciences (SPSS) version 20, Armonk, NY: IBM Corp., which was used for statistical analysis of data, as it contains the test of significance given in standard statistical books.

Descriptive statistics

Data were summarized using the following:

- (1) The arithmetic mean as an average, describing central tendency of observations for each variable studied.
- (2) The standard deviation as a measure of dispersion of results around the mean.
- (3) The frequency and percentage of observations for each variable studied.

Inferential statistics

Multivariate logistic regression analysis was used to test the independent risk factors for the occurrence of UTI. Regarding the level of significance, for all statistical tests done, the threshold of significance was fixed at the 0.5 probability, where *P* value less than or equal to 0.05 indicated significant result, and *P* value greater than 0.05 was considered nonsignificant.

Results

The results of this study are presented in three main sections: first, description of the pregnant women; second, prevalence of UTIs; and third, risk factors of UTIs among the pregnant women.

Section 1: description of the pregnant women

This section includes description of the pregnant women by their sociodemographic characteristics, reproductive history, medical and family history of chronic disease, and personal hygiene and habits.

Table 1 represents the distribution of pregnant women by their sociodemographic characteristics. This table shows that the mean age of the pregnant women was 22.8 ± 6.2 years old. More than one-third of the pregnant women (37.3%) had secondary education, whereas 5% were able to read and write. As for occupation, most women (87.3%) were not working. Moreover, more than two-thirds (75.7%) of pregnant women were living in rural areas. Regarding type of toilet, more than half (55.5%) of the pregnant women used unhygienic toilet. Regarding the monthly income, most pregnant

Table 1 Distribution of pregnant women according to their sociodemographic characteristics

Variables	Category	Frequency (n=440)	%
Age	<20	34	7.7
	20–	255	58
	30–	145	33
	≥40	6	1.4
	Mean		22.8±6.2
Educational level	Not read and write	49	11.1
	Read and write	22	5
	Primary school	40	9.1
	Preparatory school	77	17.5
	Secondary school	164	37.3
Occupation	University	88	20
	Not working	384	87.3
Residence	Working	56	12.7
	Rural	333	75.7
Type of toilet	Urban	107	24.3
	Baldy	244	55.5
Monthly income	Afranji	196	44.5
	500–1000 Egyptian pounds	415	94.3
	300–<500 Egyptian pounds	20	4.5
Sanitary drainage	>1000 Egyptian pounds	5	1.1
	Yes	245	55.7
	No	195	44.3

women (94.3%) had income from 500 to 1000 Egyptian pounds. Regarding sanitary drainage, more than half (55.7%) of the pregnant women had sanitary drainage.

Table 2 represents the distribution of pregnant women according to their reproductive history. Results showed that more than two-fifths (46.3%) of the pregnant women were multigravida, with a mean of 1.77 ± 0.42 pregnancy and range was from 1 to 8. Concerning parity, more than half (51.6%) of the pregnant women were multipara with a mean of 1.22 ± 0.87 delivery and range was from 1 to 6. Regarding to the history of previous delivery, more than two-thirds (71.4%) of the pregnant women had previous delivery. In relation to the modes of previous delivery among the pregnant women, more than half (57.6%) of them had cesarean section. More than one-third (39.5%) of the pregnant women used different methods of contraceptives. In relation to the types of contraceptives used by women, majority of them (82.8%) used hormonal contraceptives. Regarding previous history of infection with previous pregnancies, 33% of the pregnant women had a previous history of infection with previous pregnancies. In relation to the types of infection among the pregnant women, more than two-thirds (80%) of them had vaginitis.

Table 2 Distribution of pregnant women according to their reproductive history

Variables	Category	Frequency (n=440)	%
Gravidity	Primigravida	101	23
	Second gravida	100	22.7
	Multigravida (3–5)	204	46.3
	Grand multigravidity (>5)	35	8
	Mean±SD	1.77±0.42	
Parity	Nullipara	126	28.6
	Primipara	87	19.8
	Multipara	227	51.6
	Mean±SD	1.22±0.87	
History of previous delivery	Yes	314	71.4
	No	126	28.6
Types of previous delivery (n=314)	Vaginal delivery	133	42.4
	Cesarean section	181	57.6
Use of contraceptives	Yes	174	39.5
	No	266	60.5
Types of contraceptives (n=174)	Hormonal	144	82.8
	IUD	30	17.2
	History of infection	Yes	145
Types of infection (n=145)	No	295	67
	Urinary tract infection	29	20
	Vaginitis	116	80

IUD, intrauterine device.

Regarding pregnant women with medical history, the results showed that 11.6% of the pregnant women had medical disease history, and each pregnant woman had more than one disease. More than half of them (54.9%) had hypertension, more than a third (37.3%) of them had diabetes, 13.7% of them had anemia, and 7.8% of them had heart disease. Moreover, 31.1% of the pregnant women had a family history of disease, and each pregnant women had more than one disease in her family; more than two-thirds of them (73.7%) had diabetes, 33.6% had hypertension, 3.6% of them had liver disease, and 1.46% had allergy.

Table 3 represents the distribution of the pregnant women according to their personal hygiene and habits. This table shows that more than two-thirds of the pregnant women used cotton underwear (70.5%). Overall, 18.9% of them were boiling underwear, 10.5% of them lent their underwear, and 15.2% of them used local antiperspirant. More than half of the pregnant women washed their hands before use of toilet (56.4%) and majority of pregnant women (92.5%) washed their hands after use of toilet. Moreover, 30% of the pregnant women used vaginal

douche. More than two-thirds (69.3%) of them did precoital wash, and most pregnant women did postcoital wash (98.6%). The results indicated that more than two-thirds (67.7%) of them did precoital micturition, and most pregnant women did postcoital micturition (88.4%).

Regarding practicing of sexual intercourse, the results indicated that more than two-thirds of the pregnant women practiced sexual intercourse 1–2 times per week (68.4%) and 4.1% of the pregnant women practiced sexual intercourse 5–6 times per week, with a mean of 1.36±0.56 times per week. Concerning daily fluid intake, approximately two-thirds (66.4%) of the pregnant women drank from six to eight glasses per day and 2.7% drank more than eight glasses per day, with a mean of 1.74±1.1 glasses per day. Regarding delayed voiding, most pregnant women delayed voiding 1–2 times per day (90.9%), and 1.4% of the pregnant women delayed voiding 5–6 times per day, with a mean of 1.1±0.35 times per day. Most pregnant women (97.7%) urinated before sleep (Table 3).

Section II: prevalence of UTIs

This section was concerned with the prevalence of UTIs and incidence of symptomatic and asymptomatic UTIs among the pregnant women.

Table 4 and Fig. 1 represent distribution of pregnant women according to results of the urine analysis. Results indicated that the prevalence of UTIs was 42.3% among the pregnant women. The types of UTIs isolated were as follows: symptomatic UTI was diagnosed in 59% and asymptomatic UTI was identified in 41% among pregnant women who had UTIs, as shown in Fig. 2. The prevalence of symptomatic UTIs and asymptomatic UTI among the total pregnant women was 25 and 17.3%, respectively, as shown in Fig. 3.

Section III: risk factors of UTIs among the pregnant women

This section was concerned with factors that might affect the incidence of UTIs.

Table 5 represents the risk factors that might increase the incidence of UTIs. This table shows that there was a statistically significant difference between UTIs and educational level ($\chi^2=10.463$ and $P=0.01$). Moreover, there was a statistically significant difference between UTIs and occupation ($\chi^2=4.936$ and $P=0.02$). In

Table 3 Distribution of pregnant women according to personal hygiene and habits

Variables	Category	Frequency (n=440)	%
Types of underwear	Cotton underwear	310	70.5
	Nylon underwear	130	29.5
Boiling underwear	Yes	83	18.9
	No	357	81.1
Lending underwear clothes	Yes	46	10.5
	No	394	89.5
Use local antiperspirant	Yes	67	15.2
	No	373	84.8
Wash hands before toileting	Yes	248	56.4
	No	192	43.6
Wash hands after toileting	Yes	407	92.5
	No	33	7.5
Practice of vaginal douching	Yes	132	30
	No	308	70
Precoital wash	Yes	305	69.3
	No	135	30.7
Postcoital wash	Yes	434	98.6
	No	6	1.4
Precoital micturition	Yes	298	67.7
	No	142	32.3
Postcoital micturition	Yes	389	88.4
	No	51	11.6
Number of sexual intercourse per week	1–2 times	301	68.4
	3–4 times	121	27.5
	5–6 times	18	4.1
	Mean±SD	1.36±0.56	
Daily fluid intake	6–8 glasses	292	66.4
	>8 glasses	12	2.7
	<6 glasses	90	20.5
	<4glasses	46	10.5
	Mean±SD	1.74±1.1	
Voluntary delay of voiding	1–2 times	400	90.9
	3–4 times	34	7.7
	5–6 times	6	1.4
	Mean±SD	1.1±0.35	
Urination before sleep	Yes	430	97.7
	No	10	2.3

Table 4 Distribution of pregnant women according to results of urine analysis

Urine analysis	Frequency (n=440)	%
Normal	254	57.7
Urinary tract infections	186	42.3

*Have pus cells–bacteria–nitrite–leukocytes.

addition, that there was a statistically significant difference between UTIs and gravidity ($\chi^2=3.982$ and $P=0.04$). Moreover, there was a statistically significant difference between UTIs and type of underwear used ($\chi^2=4.757$ and $P=0.03$), and there was a statistically significant difference between UTIs and daily fluid intake ($\chi^2=55.583$ and $P=0.001$). The prevalence was seen to be higher among pregnant women who had secondary education, not working pregnant women,

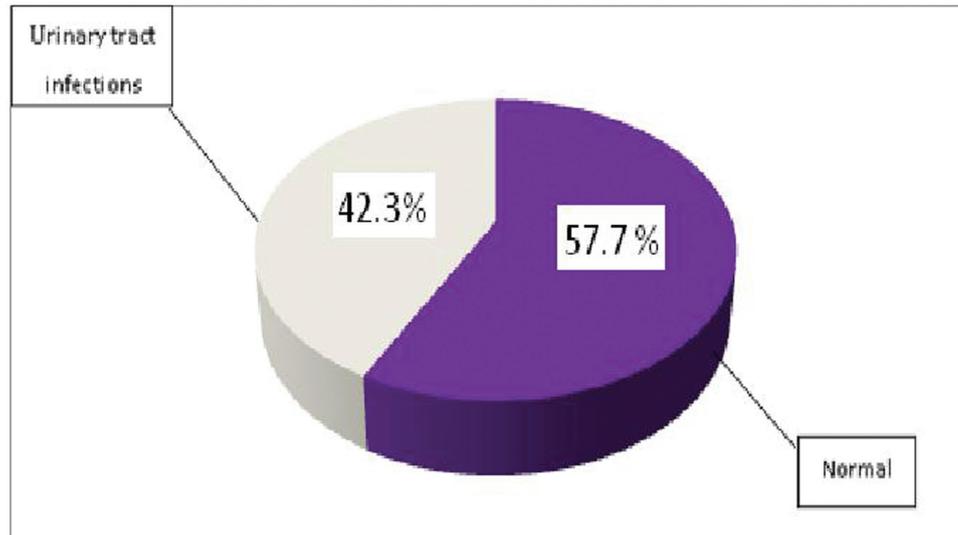
multigravida pregnant women, those who used synthetic underwear, and those who drank less than six glasses per day.

Discussion

UTIs are one of the most common human bacterial infections (Chu and Lowder, 2018). Results of this study are discussed in two parts. The first part is concerned with the prevalence of UTIs (symptomatic and asymptomatic) among pregnant women. The second part focuses on the risk factors of UTIs among pregnant women.

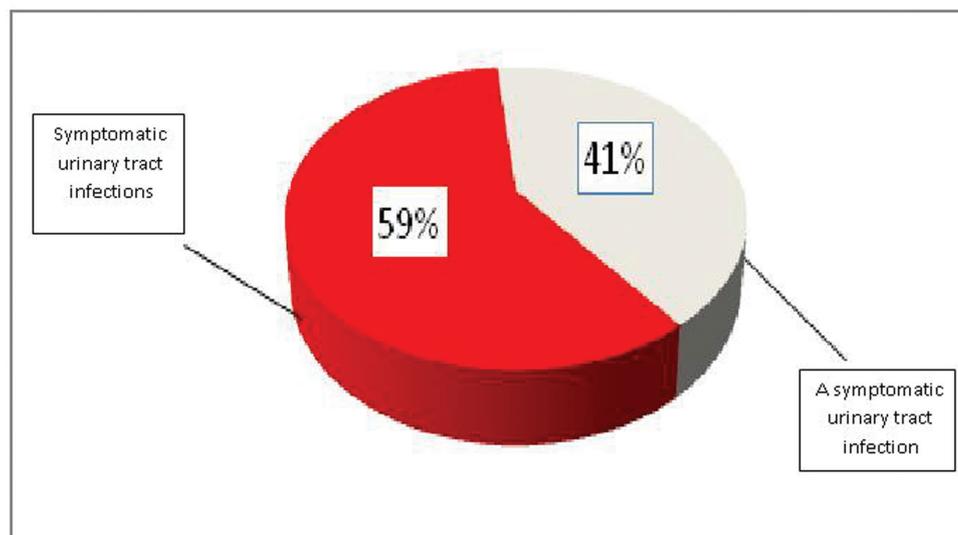
Regarding the prevalence of UTIs among pregnant women, the findings of the present study indicated that more than one-third of the pregnant women had UTIs. This finding is matched with the result of

Figure 1



Distribution of pregnant women according to results of urine analysis.

Figure 2



Percentage distribution of symptomatic and asymptomatic urinary tract infections among the pregnant women having urinary tract infections.

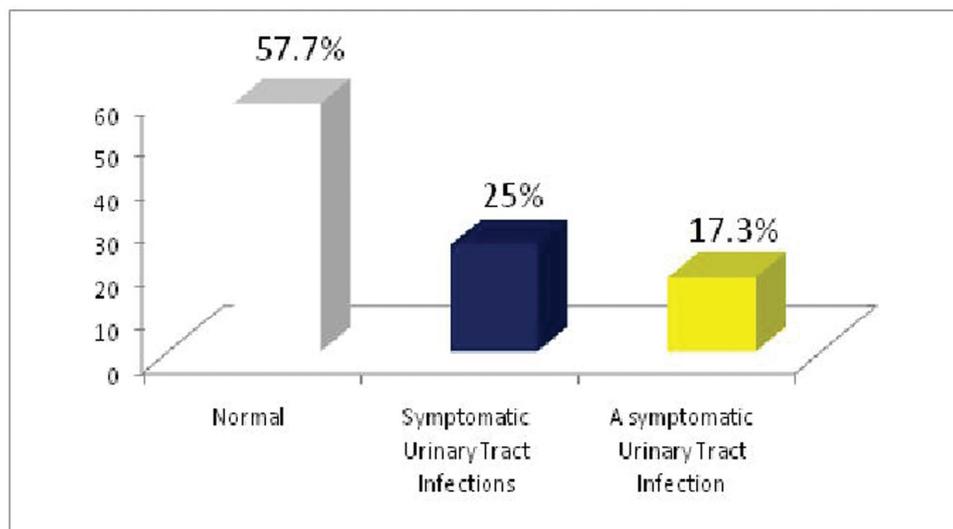
Okonko *et al.* (2010) who conducted a study of detection of UTI among pregnant women in South-Western Nigeria and found that the prevalence rate of UTIs was 47.5% in Nigeria, and also with Oladeinde *et al.* (2011), who studied UTI in a rural community of Nigeria and reported the prevalence of UTIs was 39.69% in Edo State in Nigeria.

In addition, the finding of this study is in agreement with Ahmed *et al.* (2016), who conducted a study on the incidence of UTIs and determination of their susceptibility to antibiotics among pregnant women and found that the incidence of UTIs among pregnant

women in India was 39%, and also matched with Parida *et al.* (2018), who conducted a study of prevalence of UTI in pregnant women in a tertiary care hospital of Odisha and reported that the prevalence of UTIs among studied pregnant women in Odisha was 49.4%.

On the contrary, Shaheen *et al.* (2016) conducted a study on the prevalence of UTIs among pregnant women at Menoufia governorate and reported that the prevalence of UTIs among pregnant women was 32%. Moreover, the current study disagrees with Altaf *et al.* (2017), who conducted a study on the incidence of UTIs among antenatal patients in India and reported

Figure 3



Prevalence of symptomatic and asymptomatic urinary tract infections among pregnant women.

Table 5 Risk factors that might affect the incidence of urinary tract infections

Characteristics	Infected (n=186) [n %]		Noninfected (n=254) [n (%)]		χ^2	P value
Educational level						
Cannot read or write	15	8.06	34	13.38	10.463	0.01
Read and write	11	5.91	11	4.33		
Primary school	24	12.9	16	6.29		
Preparatory school	27	14.5	50	19.68		
Secondary school	73	39.24	91	35.82		
University	36	19.35	52	20.47		
Occupation						
Not working	170	91.39	214	84.25	4.936	0.02
Working	16	8.6	40	15.7		
Gravidity						
Primigravida	34	18.27	67	26.37	3.982	0.04
Second gravida	50	26.9	50	19.7		
Multigravida (3-5)	180	96.8	24	9.4		
Grand multigravida (>5)	20	10.8	15	5.9		
Types of underwear						
Cotton underwear	100	53.7	210	82.7	4.757	0.03
Synthetic underwear	117	62.9	13	5.1		
Daily fluid intake						
6-8 glasses	49	26.3	243	95.66	55.583	0.001
>8 glasses	5	2.68	7	2.755		
<6 glasses	62	33.33	28	11.02		
<4 glasses	32	17.2	14	5.5		

that the incidence of UTIs in pregnant women was 30%. In addition, this finding is also consistent with Rejali and Ahmadi (2019), who reported that the prevalence of UTIs among the studied pregnant women in Iran was 13.1%. These variations in results could be explained owing to the differences in geographical location, socioeconomic levels, cultural and religious behaviors related to personal hygiene, and sexual contact.

The current study results indicated that symptomatic UTIs represented approximately a fourth of the pregnant women. This study is in agreement with that of Parveen *et al.* (2011), who studied the prevalence of UTI during pregnancy and reported that the prevalence of UTIs was 26% in Dhaka. Moreover, the findings of the current study are supported by Mohammad (2013), who reported the prevalence of UTIs was less than one-third of the

studied pregnant women in Suez Governorate. In addition, the findings of the current study are congruent with Ebidor (2015), who reported that the prevalence of UTIs in pregnant women was 25.3% in Amassoma, Southern Nigeria. Moreover, the findings of the current study are supported by Mohamed *et al.* (2017), who found that 29% of the studied women had UTIs in Ismailia City.

On the contrary, Rao (2018) conducted a study titled 'Symptomatic and ASB in pregnancy with special reference to HIV-positive antenatal women' and reported that the prevalence of symptomatic UTIs in pregnant women was 35% in Khammam. In addition, the findings of the current study are incongruent with Younis *et al.* (2019), who conducted a study titled 'prevalence of UTI among pregnant women and its risk factor in Derna City' and reported that the prevalence of symptomatic UTIs was 47.1% in Derna City. Moreover, the findings of the current study are consistent with Lee *et al.* (2020) who conducted a study titled 'UTI in pregnancy in a rural population of Bangladesh: population-based prevalence, risk factors, etiology, and antibiotic resistance' and found that the prevalence of symptomatic UTIs was 4.4% in Bangladesh. These variations may be explained by the fact that there were differences in the environments, social habits of the community, socioeconomic statuses, the standards of personal hygiene, and education of the patients who were studied.

The current study results showed that asymptomatic UTI (ASB) represented less than one-fifth of the pregnant women. This study is in agreement with that of Tadesse *et al.* (2014) who found that the prevalence of ASB in pregnancy was 18.8% in Ethiopia. In addition, the findings of the current study are in agreement with that of Elzayat *et al.* (2017), who found that the prevalence rate of ASB during pregnancy at two tertiary centers in Cairo, Egypt, was 10%. Moreover, these results are in agreement with Musona-Rukweza *et al.* (2017), who reported that the prevalence of ASB among pregnant women in Harare, Zimbabwe, was 14.2%.

However, the previous findings of the current study are contradicted by the study conducted by Patnaik *et al.* (2017), who found that 25.3% of infected women have no symptoms of UTI in India. These results are also in disagreement with Ayoyi *et al.* (2017), who reported that the prevalence of ASB in pregnancy in Kenya was 21.5%. Differences in results of the previous studies might be related to different sample size, different

culture, differences in UTI perception, geographical differences, ethnicity, setting of study (primary care, community based, or hospital), mode of screening (urine dipstick, microscopy, and culture), variations in the environment, and socioeconomic status of the pregnant women.

Regarding the risk factors that might affect the incidence of UTIs among pregnant women, the findings of the present study revealed that synthetic underwear, decreasing fluid intake, multigravidity, occupation, and educational level were risk factors that might affect the incidence of UTIs.

Regarding the educational level of pregnant women, the current study showed that about two-fifths of pregnant women with UTIs had secondary school education. This finding is supported by Shaheen *et al.* (2016) who found that more than two-thirds of the pregnant women with UTIs were in the middle educational level (diploma or equivalent). In addition, Chand *et al.* (2018) found a significant association between significant bacteriuria and education level. This may be owing to low or moderate education attributing to lack of information source about UTIs, which may increase the incidence of UTIs. Moreover, more than a third of the pregnant women had secondary education. This result is inconsistent with Elzayat *et al.* (2017), who reported in their study of 171 pregnant women that there was no statistically significant association between educational level and ASB. This variation might be owing to the difference of sample size and culture between the two settings of the studies.

Regarding occupation, the current results revealed that not working was a predictor variable for the incidence of UTIs, as most pregnant women with UTIs were not working. This study is in agreement with Shaheen *et al.* (2016), who showed that more than half of UTIs among pregnant women were found among housewives (58.2%). In addition, the current study finding is in agreement with Ali and Abdallah (2019), who found that most of the patients with UTIs were unemployed. This finding may be owing to most pregnant women were not working, and unemployment is associated with low standard of living and poverty, which promote infectious diseases.

This finding is contradictory to the finding of Okonko *et al.* (2010) in Nigeria, who found that more than two-thirds of UTIs among pregnant women were among civil workers (77.8%), followed by teachers (70%), and business women (53.8%), and the lower percentages were among students (30.4%) and housewives (36.4%).

In addition, Nabbugodi *et al.* (2015) found that there was no statistically significant relation between occupation and UTIs. From the research investigator's point of view, this could be attributed, in part, to the variation in the environment and educational level of the pregnant women, and most pregnant women have no time, and there are many burdens on them.

This study result revealed that gravidity is another predictor variable that might affect the incidence of UTIs, in which the incidence was found to be highest in the multigravidas pregnant women. This finding is in agreement with Ali *et al.* (2011) who found that multiparity was found to be an important risk factor, as 5% multiparas compared with 2.5% primigravida were having ASB. In addition, the current study finding is consistent with Younis *et al.* (2019) who found that multigravida was found to be an important risk factor, as 70% of those who had UTIs were multigravida.

From the researchers' point of view, this may be owing to the profound physiologic changes in urinary tract during pregnancy, which are more likely to occur in women who have pregnancies in rapid succession. In congruent with the previous findings, Mohamed *et al.* (2017) and Ranjan *et al.* (2017) found no statistically significant relation between gravidity and UTIs. This discrepancy could be attributed to the difference in sample size.

Concerning the type of underwear, wearing synthetic underwear is another predictor variable that might contribute to incidence of UTIs. Findings of the current study indicated that more than half of the pregnant women with UTIs used synthetic underwear. This study finding is supported by many researchers, such as Wamalwa *et al.* (2013), Shaheen *et al.* (2016), and Mohamed *et al.* (2017), who reported that unsatisfactory personal hygiene practices such as using underwear made of material other than cotton had a significant role in developing UTIs during pregnancy.

This may be owing to wearing synthetic underwear, which are nonabsorbent, hence more susceptible to leading to infection by creating a conducive environment for microbial growth and increasing susceptibility to UTIs. However, the previous finding of the current study is contradicted by a study conducted by Sheikh (2000), who found that wearing synthetic underwear had no significant effect on the development of UTIs in a study conducted in Pakistan.

The current study result revealed that decreased fluid intake is a predictor variable that might affect the

incidence of UTIs, as approximately one-third of the pregnant women with UTIs were found to have low fluid intake (<six glasses daily) (33.33%). This finding is supported by Badran *et al.* (2015) who reported that low intake of fluids was statistically significantly associated with UTIs. This may be related to increased fluid intake, in particular, has several theoretical methods for reducing the risk of UTIs, ranging from diuresis acting to diluting the concentration of uropathogens, thus reducing the potential for clinical infection; antegrade urine flow is thought to have a 'flushing' effect on uropathogens from the urinary tract, and is also needed for the maintenance of optimal urine pH to decrease the potential for bacterial adhesions to the urothelium. On the contrary, Beetz (2003) in his study titled 'mild dehydration: a risk factor of UTI?' reported that there is no definitive evidence that the susceptibility for UTI is dependent on fluid intake. These variations could be explained by differences in geographical location.

Conclusion

The prevalence of UTIs among pregnant women at the obstetrics and gynecology outpatient clinic of Sohag University Hospital was high. Overall, 41% of the pregnant women who had UTIs were asymptomatic. Synthetic underwear, decreasing fluid intake, multigravidity, occupation, and educational level were risk factors that might affect the incidence of UTIs.

Recommendations

Based on the results of this study, the following are recommended:

- (1) Further studies are necessary to examine the effect of health education program on relieving symptoms and reducing recurrence of UTIs during pregnancy.
- (2) Further studies are necessary to examine the prevalence of UTIs among different Egyptian governments during pregnancy.
- (3) Further studies are necessary to examine complications of UTIs on pregnancy outcome.
- (4) Health education about personal hygiene and habits should be emphasized by antenatal care professionals to all pregnant mothers.
- (5) Routine urine analysis tests should be carried out for all pregnant women every visit.

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Conflicts of interest

There are no conflicts of interest.

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