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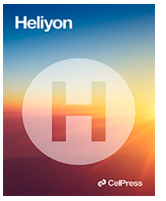

Research article

Knowledge and prevalence of urinary tract infection among pregnant women in Lebanon

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ABSTRACT

Urinary tract infections (UTIs) rank among the most prevalent medical complications during pregnancy, affecting a significant number of women of reproductive age. We aimed to determine the prevalence of urinary tract infections among pregnant women and assess their knowledge of developing UTIs in Lebanon. A cross-sectional descriptive study was conducted among 215 pregnant women in Lebanon recruited via convenience sampling from various gynecologists and midwives between March 2023 and May 2023. A structured questionnaire was utilized to evaluate UTI prevalence and participants' knowledge levels. Data analysis was performed using SPSS Statistics version 27. A significance level of $P < 0.05$ was considered statistically significant for all analyses. This analysis revealed a UTI prevalence of 42.79% (95% CI: 38.21%–47.37%), The mean age of participants was 28.57 years. Knowledge assessment revealed that 66.51% (143/215) had average knowledge about UTIs, 20.47% (44/215) demonstrated good knowledge, and 12.79% (28/215) showed poor knowledge. Significant correlations were found between UTI prevalence and socioeconomic factors ($P = 0.03$), indicating higher incidence among women from lower economic backgrounds. Abnormal vaginal discharge was strongly associated with UTI prevalence ($P < 0.001$), suggesting it as a prominent symptom or risk factor. Additionally, a history of abortion correlated significantly with increased UTI incidence ($P = 0.02$), highlighting its relevance in pregnancy-related UTI risk. The study underscores the need for education programs tailored to raise awareness about UTI risks during pregnancy and promote preventive measures. Implementing these programs could significantly enhance maternal health outcomes in Lebanon.

1. Introduction

UTIs occur when bacteria infiltrate the urinary tract and cause inflammatory reactions in the urothelium [1]. UTI is a prevalent clinical issue, ranking as the third most commonly encountered infection in humans, following respiratory and gastrointestinal infections [2]. Based on surveys conducted in various healthcare settings such as office practices, hospital-based clinics, and emergency departments, it has been estimated that UTIs account for more than eight million cases each year in the United States. Furthermore, UTIs result in over one million hospitalizations, contributing to an annual cost exceeding $1 billion [3]. UTI occurs when

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microorganisms invade the tissues along the path from the urethral opening to the renal cortex. Bacterial infections affecting the urinary tract are the primary cause of both community-acquired and hospital-acquired infections (HAI) among patients admitted to healthcare facilities in the United States [2]. Anatomical factors and modifications also contribute significantly to the development of UTIs in women compared to men. The relatively short length of the urethra, coupled with its proximity to the anus, creates a favorable environment for bacteria to ascend within the urinary tract [4] From a clinical perspective, UTIs can be characterized by two primary presentations: symptomatic and asymptomatic bacteriuria (ASB) [5]. The variation in UTI presentation depends on multiple factors, including the specific part of the urinary tract affected, the causative organisms involved, the severity of the infection, and the individual's immune response capability to combat it [6]. Asymptomatic and symptomatic UTIs have significant implications for public healthcare, impacting quality of life and leading to work absenteeism. The symptoms of UTIs, such as fever, dysuria (burning sensations during urination), lower abdominal pain (LAP), itching, development of blisters and ulcers in the genital area, genital and suprapubic pain, and the presence of pus in the urine (pyuria), generally differ depending on the age of the person affected and the particular site of the urinary tract that is affected [6].

The definitive method for diagnosing a UTI involves identifying the pathogen in the urine, especially in patients exhibiting non-specific symptoms. This is achieved through urine culture, which not only detects and identifies the pathogen but also enables the quantitative assessment of bacteriuria. A minimum level of bacteriuria, indicating a urinary tract infection, has been established at a count of 10^3 colony-forming units per milliliter (CFU/mL), along with the presence of significant pyuria [7].

UTI ranks as the second most frequent bacterial infection and is the most prevalent bacterial disease among pregnant women [8]. It is estimated that around one out of every three women will likely face a UTI at some point [1]. Approximately 8.3 million pregnant women worldwide experience UTIs annually. This increase in prevalence is attributed to the enlargement and additional weight of the uterus, which disrupts normal bladder function and results in symptoms such as incomplete voiding, urine dribbling, and frequent urination [9]. Urinary tract infections in pregnant women can give rise to various complications, including the delivery of infants with low birth weight, an increased risk of abortion, preterm birth, development of preeclampsia, preterm labor, stillbirth, chronic pyelonephritis, and, in rare cases, kidney failure [8]. While the likelihood of developing acute episodes of UTI is relatively low in the early stages of pregnancy, there is a significant increase in risk during the final trimester, ranging from 30 %–60 % [10]. Neglecting early treatment of a UTI can have adverse consequences on the well-being of the baby [8].

Throughout pregnancy, notable anatomical changes occur in the urinary system, primarily influenced by elevated progesterone levels. This hormone relaxes the walls of the ureters, promoting their expansion and bending. Additionally, the expanding uterus exerts pressure on the urinary system [9]. The alterations encompass the widening of the urethra, an increase in bladder capacity, a reduction in bladder muscle tone, and a decline in ureteral muscle tone. These changes result in heightened urinary stasis and the potential for vesicoureteral reflux [7]. Due to the normal physiological changes that occur during pregnancy, including reduced immunity, increased plasma volume, decreased urine volume, and gestational glycosuria, pregnant women are more susceptible to UTIs [11]. Additional research has indicated a notable occurrence of UTIs among pregnant women, with contributing factors including low socioeconomic status, prior history of UTI, frequent sexual intercourse, anemia, and diabetes mellitus [12]. A deeper understanding of the causes of UTIs during pregnancy could present novel possibilities for preventing this condition.

The prevalence of UTIs differs depending on the population being studied [13]. Based on the conducted research, it has been determined that the prevalence of symptomatic UTIs in pregnant women is approximately 17.9%, while the prevalence of asymptomatic infection is around 13% [14]. According to Ocher et al. (2018), the prevalence rate of UTI among pregnant women attending antenatal clinics was found to be 31.0%. However, the prevalence of symptomatic urinary tract infection in pregnant women, as observed in this study, was lower than the rates reported by Onuorah et al. (2016) and Onuoha and Fatokun (2014), which were 32.7% and 55% respectively. On the other hand, it was higher than the rate of 21.7% reported by Akinloye et al. (2006) in their study on the prevalence of asymptomatic bacteriuria in pregnancy in Ibadan, Oyo State [14]. Based on a conducted study by Ranjan et al. (2017), the occurrence of UTIs in pregnant women in Bhimavaram was found to be 35%. Additionally, Yasmin et al. (2018) conducted a study in Katihar district, Bihar, which showed a prevalent rate of 28% for UTIs among pregnant women [15].According to a study investigated by Solomon Taye et al. in Bale Zone, Southeast Ethiopia, the prevalence of UTIs among pregnant women was reported to be 35.3% [7].

Medical professionals play a crucial role in endorsing and ensuring appropriate health practices, imparting patient education, and equipping women with the necessary knowledge to identify signs and symptoms of UTI for early detection and timely treatment of future infections [16]. Acquiring knowledge in this area is expected to play a vital role in mitigating maternal and perinatal health risks associated with UTIs among pregnant women [12]. According to Santoso et al., 9.1% of participants had good knowledge, 69.7% had fair knowledge, and 21.2% had poor knowledge about UTIs. Additionally, 65.7% and 64.6% of participants had a positive perception and practiced proper measures to avoid UTI infection. Another study by Selamat et al. indicated that awareness and practice regarding UTIs among female university students in Malaysia were at a moderate level [17]. A study conducted in 2018 at the University of Angeles Foundation in the Philippines demonstrated that increasing awareness among pregnant women regarding UTIs and preventive measures played a significant role in reducing the occurrence of UTIs [17]. Hence, accurate evaluation of knowledge and practices is essential for developing effective preventive strategies that prioritize the well-being of both the mother and the baby [18]. Similarly, another study focused on UTIs revealed that enhancing education among individuals contributed to a decrease in the incidence of UTIs [17].

However, there is a lack of extensive research on the prevalence of UTIs among pregnant women in Lebanon, as well as their level of awareness and knowledge regarding preventive practices. The goal of this research was to determine the prevalence of UTI among pregnant women and to assess their knowledge. This research will help the Lebanese community know the percentage of prevalence and level of knowledge so we can work on minimizing this incidence.

2. Materials and methods

Ethical approval

The study received ethical approval from the Beirut Arab University Institutional Review Board under the approval number 2024-H-0180-HS-M-0595. Before participating in the study, all participants provided informed consent.

2.1. Study area, study population and study design

A cross-sectional descriptive study was conducted among pregnant women attending prenatal care checkups with their Gynecologists and with the assistance of midwives in Lebanon. This method was chosen due to practical considerations and accessibility to participants during routine healthcare visits. The research was conducted from March 2023 to May 2023. A convenience sample of pregnant women from all over Lebanon was utilized for this research. Access to potential participants was facilitated through collaboration with gynecologists and midwives who provided access to pregnant women during their prenatal care visits. Specifically, the study included centers in Beirut, Tripoli, Beqaa, Saida, and Sour. These locations were chosen to ensure a representative sample of pregnant women receiving prenatal care in different socioeconomic and geographic settings. This comprehensive approach allows for a more accurate assessment of UTI prevalence and knowledge levels among pregnant women across Lebanon. The study employed specific inclusion and exclusion criteria to ensure the selection of eligible participants. This study included pregnant women from various healthcare facilities across Lebanon who voluntarily agreed to participate by signing an informed consent form and completing the research questionnaire. Participants were recruited regardless of their gestational stage, aiming to capture a diverse representation of pregnant women in the study. Exclusion criteria included women with pre-existing urogenital conditions or a history of urological surgery, as these factors could potentially influence the study outcomes related to UTIs during pregnancy. These criteria were implemented to ensure that the study focused on pregnant women without prior conditions that could affect UTI prevalence and knowledge assessment.

2.2. Sample size: determination and Recruitment of study participants

The sample size was determined using the following formula.: $n = N \times X/(X + N - 1)$. "X" represents the margin of error, which was calculated based on the estimated proportion of pregnant women with UTIs in the population. Specifically, "X" was determined using a confidence interval approach to ensure the sample size was sufficient to achieve reliable and valid results. A total of 195 participants were included, with N representing the estimated number of pregnant women in the Lebanese population [19]. To enhance representativeness, reduce sampling errors, improve the generalizability of the results, and account for potential attrition, a total of 215 pregnant women were included in the sample. Out of the 215 pregnant women approached, all 215 agreed to participate, resulting in a response rate of 100 %. This high response rate reflects the effective collaboration with healthcare providers and the willingness of pregnant women to contribute to the study.

2.3. Data tools

The self-administered questionnaire consisted of four components. The questionnaire was adapted from previous studies similar to ours, ensuring its relevance and credibility for assessing the prevalence and knowledge of UTIs among pregnant women. This adaptation allows for the utilization of a validated tool that has been previously tested in similar research contexts, thereby enhancing the reliability and validity of our findings.

a) Part I collected demographic information such as age, height, weight, history of any diseases, and medication usage. The measurement was self-reported by participants through the questionnaire.
b) Part II presented the socio-demographic characteristics of the study participants, including their education level, marital status, employment status, socioeconomic status, and area of residence. The measurements were self-reported through specific questions in the questionnaire.
c) Part III assessed the knowledge and awareness regarding the causes of UTIs, especially during pregnancy. It included seven questions. Scores 1–5, 6–10, and 11–15 were categorized as poor, average, and good knowledge, respectively, with a maximum of 15 correct answers. This scoring was based on a range of 5, and equal weight for each correct answer was given. A scoring system was implemented in which each correct response was assigned one point. To obtain an overall knowledge score, the scores for each respondent across all questions were summed.
d) Part IV determined the prevalence of UTIs among pregnant women using the question “Have you been diagnosed with a UTI this pregnancy?”. It also assessed potential risk factors that could contribute to the increased occurrence of UTIs. This section included ten different questions [7].Participants were asked if they had been diagnosed with a UTI during their current pregnancy. Additional questions assessed other potential risk factors.

The questionnaire was reviewed by a panel of experts for content validity and piloted with a small sample to ensure clarity and reliability. The experts assessed whether the questions were representative of the content domain and made the necessary revisions to enhance clarity and comprehensiveness. The consistency and reliability of the questionnaire were further enhanced through multiple

rounds of expert reviews and revisions, ensuring that the questions measured the intended variables reliably. Detailed instructions were provided to both participants and healthcare providers to ensure that the questionnaire was administered consistently across all participants.

2.4. Data collection

Permissions were obtained from the heads of the participating healthcare facilities, allowing researchers to conduct the study within these centers. The study was conducted in collaboration with various healthcare facilities across Lebanon where pregnant women receive prenatal care. These facilities included both governmental and private clinics. Governmental centers are operated by public health authorities, providing subsidized healthcare services, whereas private clinics are privately owned and typically offer fee-based services. The participating centers varied in their referral status, with some serving as primary care facilities and others as referral centers where patients are referred for specialized care. This diversity in center characteristics aimed to capture a broad spectrum of pregnant women from different healthcare settings across Lebanon. The researcher distributed surveys and coordinated with healthcare providers, including gynecologists and midwives, to inform them about the study's objectives, procedures, and ethical considerations. This collaboration ensured that healthcare providers understood the importance of the research and their role in facilitating access to potential participants. Healthcare providers were instructed to introduce the study to pregnant women during their routine prenatal care appointments. They explained the study's purpose, outlined the voluntary nature of participation, and distributed informed consent forms to interested individuals. This approach ensured that participants received detailed information about the study and had the opportunity to ask questions before deciding to enroll. Strict protocols were implemented to maintain participant confidentiality and ensure compliance with ethical guidelines throughout the data collection process. Informed written consent was obtained, and stringent measures were implemented to ensure the confidentiality of the collected information.

2.5. Data analysis

The collected data were cleaned, recorded, and securely saved in Excel spreadsheets. Data analysis was performed using SPSS Statistics version 27. Descriptive analysis was used to provide a summary of demographic and sociodemographic characteristics of the study population. Categorical data were presented as proportions and percentages. Proportionality tests were conducted using chi-square tests. A significance level of $P < 0.05$ was considered statistically significant for all analyses. The prevalence of UTI was reported as a percentage, and the level of knowledge was categorized in poor, average, and good scores.

3. Results

3.1. Socio-demographic characteristics

This study involved 215 pregnant women from Lebanon, with ages ranging from 16 to 47 and a mean age of 28.57. The majority of the participants (62.3%) were between 25 and less than 35 years old. Education attainment varied, with 44.19% holding a Bachelor's

Table 1
Socio-demographic characteristics of the participants.

Variables	Frequency (f)	Percentages (%)
Age Group		
<25 years	49	22.8
25-<35 years	134	62.3
35+ years	30	14
Educational level		
Bachelor's Degree	95	44.19
Master's Degree	51	23.72
PhD	3	1.40
Primary	12	5.58
Secondary	52	24.19
Uneducated	2	0.93
Marital status		
Married	214	99.53
Single	1	0.47
Employment		
Employed	84	39.07
Unemployed	131	60.93
Socioeconomic status		
High	7	3.26
Low	34	15.81
Medium	174	80.93
Area of residence		
Rural	36	16.74
Urban	179	83.26

degree, 23.72% a Master's degree, and 1.40% a PhD. A smaller proportion had primary education (5.58 %) or secondary education (24.72%), while 0.93 % were uneducated. The majority of the respondents, 99.53 %, were married. In terms of employment, 60.93% were unemployed, and 39.07% were employed. Regarding socioeconomic status, 80.93% had a medium status, followed by 15.81% with a low status, and 3.26% with a high status. Among the participants, 83.26% resided in urban areas, while 16.74% resided in rural areas (Table 1).

3.2. Knowledge about UTIs

It is worth noting that 193 respondents (89.77%) knew what UTI is. In addition, 161 respondents (74.88%) knew that pregnancy increases the risk of developing a UTI, while 54 (25.12%) did not have this knowledge. Moreover, 90 respondents (41.86%) believed that the third trimester carries a higher risk of a UTI during pregnancy, whereas 81 (37.67%) believed it to be the first trimester and 44 (20.47%) believed it to be the second trimester. When asked about the impact of UTI during pregnancy on the baby, 90 respondents (41.86%) thought it might affect the baby, 70 (32.56%) believed it does affect the baby, and 55 (25.58%) believed it does not. Regarding hygiene practices, the majority of respondents, 204 (94.88%), cleaned the genital area from front to back after urination, while 11 (5.12%) did not. Among the participants, 175 (81.40%) believed that taking fluids can prevent UTI, 158 (73.49%) believed that maintaining cleanliness in the area can prevent UTI, 149 (69.30%) believed that using the bathroom promptly when needed to urinate can prevent UTI, and 125 (58.14%) believed that wearing cotton can also prevent UTI. Additionally, 135 respondents (62.79%) thought that hormonal changes increase the risk of developing UTI during pregnancy; 137 (63.72%) mentioned that lack of personal hygiene increases this risk; 116 (53.95%) believed that physical changes during pregnancy raise this risk; 35 (16.28%) and 15 (6.98%) respondents mentioned that diabetes and anemia increases this risk respectively; and finally, 12 (5.58%) stated that pregnancy at an older age raises this risk (Table 2). The mean score for knowledge about UTIs among respondents was 8.25, indicating an average level of awareness and knowledge about urinary tract infections (UTIs) among the pregnant women surveyed. This suggests that while a significant portion of the participants have a basic understanding of UTIs, including risk factors, symptoms, and preventive measures, there is still room for improvement.

3.3. Level of knowledge

The percentage distribution of respondents according to knowledge shows that, out of 215 pregnant women (66.51%) respondents had average knowledge, (19.07%) had good knowledge, and (14.42%) had poor knowledge (Fig. 1).

Table 2
Assessment of respondent's knowledge regarding UTI in pregnancy.

Variables	F	%
Do you know what is a Urinary tract infection?		
Yes	193	89.77
No	22	10.23
Do you know that pregnancy increases the risk of developing UTI?		
Yes	161	74.88
No	54	25.12
Which month of pregnancy do you believe has a higher risk of UTI?		
First trimester	81	37.67
Second trimester	44	20.47
Third trimester	90	41.86
Do you think UTI during pregnancy can have an effect on the baby?		
Maybe	90	41.86
No	55	25.58
Yes	70	32.56
Do you clean the genital area from front to back after urination?		
Yes	204	94.88
No	11	5.12
What is/are the effective way to prevent developing UTI?		
Taking fluids	175	81.40
Urinate	149	69.30
Wearing cotton	125	58.14
Area clean	158	73.49
In your opinion, which of the following raises the risk of UTI during pregnancy?		
Hormonal changes	135	62.79
Lack of personal hygiene	137	63.72
Physical changes during pregnancy	116	53.95
Diabetes	35	16.28
Anemia	15	6.98
Pregnancy in old age	12	5.58

3.4. Prevalence of UTIs

The overall prevalence of UTI among pregnant women in Lebanon indicated that out of the total of 215 respondents, 123 (57.21%) pregnant women were not diagnosed with UTI, while 92 (42.79%) cases of pregnant women were diagnosed with UTI (Fig. 2). We calculated a 95% confidence interval around our prevalence estimate, which ranged from 38.21% to 47.37%. This interval reflects the precision of our findings and highlights the variability in UTI prevalence among pregnant women in our study.

3.5. Prevalence of urinary tract infections in relation to sociodemographic distribution of the subjects and positive cases

The prevalence of UTI was found to be higher among subjects in the age category <25 (53.06%) of the total population. The incidence was also found to be higher among respondents with primary educational level (66.67%). Based on the employment status, UTI prevalence was higher among unemployed women (46.56%). A high rate of UTI was found among women with a low socio-economic status (67.65%). Moreover, the incidence was higher among pregnant women living in rural areas (55.56%). A chi-square test was carried out and has shown that there is significant association between positive UTI and socioeconomic status ($P = 0.006$). However, there was no association with other variables like age where the p-value was 0.399, education status where the p-value was 0.90 and area of residence with a p-value 0.090, (Table 3).

3.6. Distribution of cases according to some risk factors

The study identified higher prevalence rates of UTI in specific groups. These groups included pregnant women in the second trimester (51.81%), individuals with multiple pregnancies (43.24%), those with a history of UTI before the current pregnancy (47.69%), and individuals with poor knowledge about UTI (51.61%). Additionally, the study found elevated prevalence rates among participants who did not use intimate hygiene wash (45.05%), those without a history of abortion (47.27%), and individuals experiencing abnormal vaginal discharge (76.67%). Another chi-square test was carried out and has shown that there was a significant difference between pregnant women having UTI and abnormal vaginal discharge ($P = 0.000$) and history of abortion ($P = 0.016$); However, no significant relationships between other risk factors since all p-value were >0.05 (Table 4).

4. Discussion

UTIs are commonly found among pregnant women at high prevalence rates and can lead to various complications during pregnancy. The findings of the current study revealed that the prevalence of UTIs among pregnant women residing in Lebanon was 42.79% of 215 samples. Our study addresses a significant gap in the literature by providing novel insights into both the prevalence of UTIs among pregnant women in Lebanon and their knowledge levels regarding UTI prevention. Prior research has predominantly focused on either prevalence rates or knowledge assessments separately; however, our study uniquely integrates both aspects, offering a comprehensive understanding of this important public health issue.

The observed prevalence in this study exceeded the global range of 13–33% [7]. This underscores the urgency of targeted interventions to mitigate UTI risks during pregnancy. The prevalence rate observed in this study was lower compared to previous studies conducted on pregnant women from other regions. For instance, a study conducted in Ebonyi, Eastern Nigeria reported a UTI prevalence of 46.5% [1]. However, the prevalence rate observed in this study was higher compared to other studies conducted in different countries, where relatively lower rates of UTI were reported. For example, prevalence rates were recorded as 38% in Iran, 28.5% in Pakistan, 14.2% in Saudi Arabia, 10.6% in Turkey, and 30% in Yemen [20] The variation in prevalence rates can be attributed to differences in geographical, environmental, and social factors among the population [21].

Various factors have been identified as contributors to UTIs among pregnant women, such as age, gestational age, and level of education [22]. However, the current study did not find any significant association between UTI occurrence among pregnant women

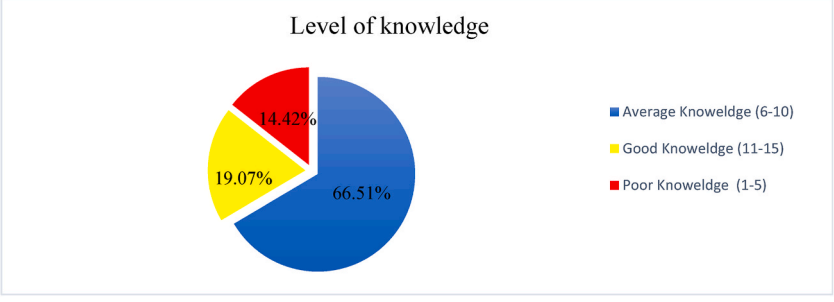

Fig. 1. Level of Knowledge Among Pregnant Women Regarding UTI Development During Pregnancy. This figure presents the distribution of knowledge levels among pregnant women concerning the development of urinary tract infections (UTIs) during pregnancy. Knowledge scores ranging from 1 to 5, 6 to 10, and 11 to 15 were categorized as poor, average, and good knowledge, respectively. Understanding these awareness levels is pivotal for implementing effective preventive measures and raising awareness to mitigate the risk of UTIs during pregnancy.

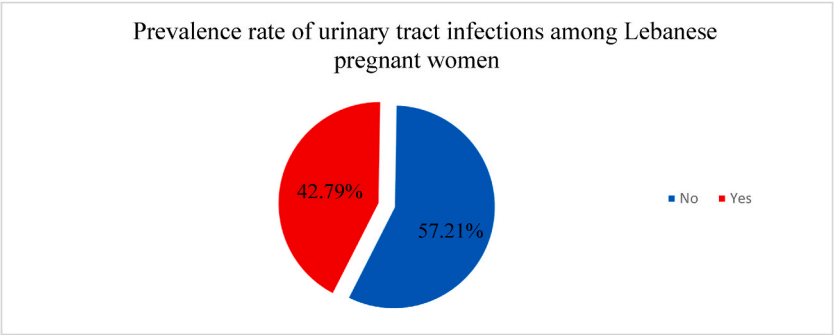

Fig. 2. Prevalence Rate of Urinary Tract Infections Among Lebanese Pregnant Women. This figure depicts the prevalence rate of urinary tract infections (UTIs) among pregnant women in Lebanon. The data highlights the frequency of UTIs within this population, shedding light on the significance of this medical condition during pregnancy. Understanding the prevalence of UTIs is crucial for developing targeted interventions and healthcare strategies aimed at reducing the incidence and impact of UTIs in pregnant women.

Table 3
Prevalence of urinary tract infections in relation to sociodemographic distribution of the subjects and positive cases.

Characteristics	Overall (N = 215)	UTI + ve (N = 92)	UTI -ve (N = 123)	p-value
Age				0.399
<25 years	23.00 %	53.06 %	46.94 %	
25-<35 years	62.91 %	40.30 %	59.70 %	
35+ years	14.08 %	36.67 %	63.33 %	
Educational level				0.090
Bachelor's degree	44.19 %	34.74 %	65.26 %	
Master's degree	23.72 %	43.14 %	56.86 %	
PhD	1.40 %	33.33 %	66.67 %	
Primary	5.58 %	66.67 %	33.33 %	
Secondary	24.19 %	53.85 %	46.15 %	
Uneducated	0.93 %	0	100.00 %	
Employment				0.162
Employed	39.07 %	36.90 %	63.10 %	
Unemployed	60.93 %	46.56 %	53.44 %	
Socioeconomic status				0.006
High	3.26 %	42.86 %	57.14 %	
Medium	80.93 %	37.93 %	62.07 %	
Low	15.81 %	67.65 %	32.35 %	
Area of residence				0.090
Rural	16.74 %	55.56 %	44.44 %	
Urban	83.26 %	40.22 %	59.78 %	

and most of the sociodemographic variables examined. Interestingly, socioeconomic status emerged as a significant factor, with a p-value of 0.006. Similar findings have been reported in several other studies, indicating a significant association between monthly income and the occurrence of UTIs during pregnancy [23].

In our study, the prevalence of UTI cases during pregnancy was highest in ages less than 25 years. Our results are in accordance with a study done in Nepal that stated that the highest incidence of UTI cases was observed during pregnancy with women aged between 21 and 25 years. This could be recognized that the subjects with this age group are sexually more active which could favor the incidence of UTIs [11]. Additionally,in our study, the incidence of UTI was more prevalent among respondents with primary education, unemployed women, and women residing in rural areas.

Regarding educational level, a study conducted by Chand et al. [24] revealed a noteworthy correlation between significant bacteriuria and the level of education. This observation suggests that individuals with lower or moderate education levels may lack adequate information sources regarding UTIs, potentially leading to an increased incidence of UTIs. However, our findings align with the study conducted by Elzayat et al. [25], who also reported no statistically significant association between educational level and ASB [26].

Regarding the occupation, although there is no association between prevalence of UTI among pregnant women and their employment status, our study showed that the highest proportion of UTIs was found among unemployed women. This study aligns with the findings of Shaheen et al.[27], who reported that a majority of UTIs among pregnant women occurred in housewives (58.2%). Furthermore, the current study's results are consistent with those of Ali and Abdallah (2019), who observed a higher prevalence of UTIs among unemployed individuals.This observation may be attributed to the fact that a significant proportion of pregnant women in the study were not employed, and unemployment is associated with a lower standard of living and increased vulnerability to infectious diseases [26].

Table 4
Distribution of cases according to some risk factors.

Characteristics	Overall (N = 215)	UTI + ve (N = 92)	UTI -ve (N = 123)	p-value
Trimester				0.101
First trimester	26.51 %	38.60 %	61.40 %	
Second trimester	38.60 %	51.81 %	48.19 %	
Third trimester	34.88 %	36.00 %	36.00 %	
Number of pregnancies				0.890
First pregnancy	48.37 %	42.31 %	57.69 %	
Not First pregnancy	51.63 %	43.24 %	56.76 %	
Abnormal vaginal discharge				0.000
No	72.09 %	29.68 %	70.32 %	
Yes	27.91 %	76.67 %	23.33 %	
Chronic conditions during pregnancy				0.630
No	92.09 %	42.42 %	57.58 %	
Anemia	0.47 %	100.00 %	0.00 %	
Diabetes	2.33 %	40.00 %	60.00 %	
Hypertension	4.19 %	44.44 %	55.56 %	
Insulin resistance	0.47 %	0.00 %	100.00 %	
Kidney pain	0.47 %	100.00 %	0.00 %	
History of UTI before this pregnancy				0.339
Yes	30.23 %	47.69 %	52.31 %	
No	69.77 %	40.67 %	59.33 %	
History of abortion?				0.016
Yes	23.26 %	28.00 %	72.00 %	
No	76.74 %	47.27 %	52.73 %	
Use of intimate hygiene wash				0.598
Yes	57.48 %	41.46 %	58.54 %	
No	42.52 %	45.05 %	54.95 %	
Level of Knowledge				0.442
Poor knowledge (1–5)	14.42 %	51.61 %	48.39 %	
Average knowledge (6-10)	66.51 %	42.66 %	57.34 %	
Good knowledge (11–15)	19.07 %	36.59 %	63.41 %	

Regarding the area of residence, while there was no significant association between the prevalence of UTI among pregnant women and their place of residence, our study found a higher incidence of UTI in rural areas (55.56%). These findings are consistent with a study conducted in Tanzania (Mkuranga District), which also demonstrated that pregnant women in rural areas were more vulnerable to UTIs, resulting in a higher prevalence of the infection. Specifically, the prevalence of UTI among pregnant women was 2.1% in urban areas and 12.5% in rural areas [28].

In this study, no significant associations were found between gestational age, number of pregnancies, and history of UTI. These findings are consistent with previous studies conducted in Tanzania and Sudan, which also reported no significant relationships between these variables and UTI [29]. The study results revealed that abnormal vaginal discharge and a history of abortion were found to be a risk factor for UTI prevalence with significant association of p-value = 0.000 and 0.016 respectively. This finding aligns with a previous study that found a similar association, indicating that pregnant women with a history of natural abortion had a 2.36 times higher likelihood of developing ASB compared to those without a history of natural abortion (p = 0.023) [30]. Some studies showed that previous history of UTI was a significant factor associated with UTI among pregnant women [7] which was not the case in this study.

In this study, 66.51% of the respondents had average knowledge regarding UTI, 19.07% had good knowledge, and 14.42% had poor knowledge. This was supported by a study done in Ndola Zambia where 17.6% of respondents had good knowledge regarding UTIs and its prevention, 62.2% of them had average knowledge, while 20.2% had poor knowledge [31]. These findings align with the results of a study conducted on the prevalence of UTI among pregnant women attending an antenatal clinic at a tertiary care center in Al Rass, Al Qassim. Their findings indicated that the majority of women had average total knowledge about UTI. Additionally, the findings are consistent with a study evaluating knowledge, attitude, and behavior related to UTI among pregnant women consulting health centers in Zahedan city, Iran. Based on the health belief model, their study revealed that only a minority of the women had a good total knowledge score [8]. The results suggest that the development and implementation of educational programs aimed at increasing awareness about the risk of urinary tract infection among female students may be beneficial in preventing such infections [14]. One limitation of this study is that we did not categorize the area of residence based on regions, which could have provided further insights into the geographical variations in UTI prevalence. Additionally, this information could have been valuable in tailoring targeted educational programs for specific regions. Another important limitation of this study is the current crisis in Lebanon, characterized by challenging socio-political and economic conditions. These circumstances may have had a significant impact on the socioeconomic status and educational level of the study population, which in turn could have influenced the results obtained. Additionally, the cross-sectional design of the study limits our ability to establish causal relationships, and the reliance on self-reported data may introduce response biases. Addressing these limitations in future research could further enhance our understanding of UTIs among pregnant women.

This study is the first in Lebanon that examined the prevalence of UTIs in pregnancy and the level of awareness and knowledge. This

will have an impact to develop campaigns that focuses on preventing UTI in pregnancy so that the prevalence will decrease. By focusing on both prevalence and knowledge levels, our research offers a holistic understanding of the issue, making our research uniquely comprehensive in addressing this important public health issue. Additionally, the detailed categorization of knowledge levels into poor, average, and good provides nuanced insights that can guide the development of targeted health education programs, highlighting the significant public health implications. The study's large sample size of 215 pregnant women further enhances the reliability of our findings.

The insights from our study on UTIs among pregnant women in Lebanon and their knowledge levels have significant implications for improving population health. Targeted health education initiatives are essential to raising awareness about UTIs, their risk factors, and preventive measures. Disseminating information through prenatal care settings, community health centers, and digital platforms for delivering targeted messages, organizing support groups for sharing experiences and concerns, and training healthcare providers to effectively communicate UTI-related information are also essential. Integrating UTI screening into routine prenatal care can facilitate early detection and treatment, thereby reducing UTI incidence and severity. Policymakers can use our findings to advocate for healthcare reforms that address socioeconomic disparities and improve access to maternal healthcare. Community engagement efforts can help reduce stigma and support proactive health-seeking behaviors. Ongoing research is crucial to monitor UTI trends and evaluate intervention effectiveness, fostering evidence-based practices to improve maternal health outcomes nationwide. By translating these insights into actionable initiatives, we can collaboratively advance maternal health and ensure comprehensive care for pregnant women in Lebanon.

5. Conclusion

Our study in Lebanon revealed a high prevalence of urinary tract infections (UTIs) among pregnant women, with 42.79% affected. Significant associations were observed with socioeconomic factors, abnormal vaginal discharge, and a history of abortion. Despite an average level of knowledge among respondents regarding UTI risks, targeted health education is crucial to improve awareness and encourage timely intervention. Addressing UTIs in pregnancy through effective public health strategies is essential to enhance maternal health outcomes and quality of care.

Our study's findings of a high UTI prevalence (42.79%) among pregnant women in Lebanon underscore urgent needs for healthcare policy and practice. Policymakers should consider integrating routine UTI screening into prenatal care protocols to facilitate early detection and management. Healthcare providers can benefit from heightened awareness of UTI risk factors such as socioeconomic status, abnormal vaginal discharge, and history of abortion, enabling targeted assessments and interventions. Additionally, strengthening health education initiatives to inform pregnant women with knowledge about UTI prevention strategies is crucial. By implementing these measures, Lebanon can potentially reduce maternal morbidity associated with UTIs, thereby improving overall maternal health outcomes and ensuring comprehensive care throughout pregnancy.

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Data availability statement

The data that supports the findings of this study is included in the article or supplementary material referenced in the article.

CRediT authorship contribution statement

Iman Abu Aleinein: Writing – original draft, Methodology, Formal analysis, Data curation. **Elie Sokhn:** Writing – review & editing, Validation, Supervision, Project administration, Conceptualization.

Declaration of competing interest

The authors report no relevant competing interests with respect to the content presented in this article.

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