

## Effect of implementing clinical pathways on Maternity Nurses' Performance and Birth Outcomes among pregnant women with urinary tract infections

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### Abstract

**Background:** Urinary tract infections are an ailment characterized by kidney inflammation that is primarily caused by bacterial infection. **Purpose:** To investigate the effect of implementing clinical pathways on maternity nurses' performance and birth outcomes among pregnant women with urinary tract infections. **Research design:** A quasi-experimental investigation was employed. **Setting:** The investigation was conducted at the outpatient facility situated within the University and Teaching Hospitals, Shebin EL-Kom, Menoufia University. **Sample:** The convenience sample encompassed all nurses within the obstetric departments and a purposive sample of 100 pregnant mothers was chosen. **Tools:** An interviewing questionnaire for the pregnant mothers, an assessment tool for the maternity nurses, and an observation checklist for birth outcomes. **Results:** After the clinical pathway application, 75% of the maternity nurses possessed commendable levels of knowledge and performance. Additionally, a noteworthy improvement was observed in the maternal and neonatal outcomes in relation to the duration of the initial phase of labor, the duration of the subsequent phase of labor, and the average APGAR score was  $9.76 \pm 0.83$  for the study group and  $9.72 \pm 0.79$  for the control group. **Conclusion:** The maternity nurses who participate in clinical pathways about urinary tract infection exhibit higher knowledge and performance scores after the implementation of clinical pathways. Furthermore, the pregnant women with urinary tract infections who underwent the clinical pathway exhibit a better maternal and neonatal outcome. **Recommendation:** Enhance the caliber of healthcare dispensed at the grassroots level via periodic evaluation of pregnant mothers with urinary tract infections.

**Keywords:** Birth outcomes, clinical pathways, urinary tract infections

### Introduction

Urinary tract infections (UTIs) possess considerable significance in the context of pregnancy. It encompasses an inflammatory response in the renal tubules, accompanied by a considerable decline in their ability to carry out the process of sodium reabsorption. The incidence of this condition during pregnancy has been observed in patients with a history of renal disease and is a frequent cause of hospitalization in the prenatal phase (Ahn et al., 2020).

During the gestational period, there is a proclivity for urinary tract infection, which can be largely attributed to physiological modifications occurring during pregnancy. Notably, in early pregnancy, ureteral dilation and renal calices are evident due to the relaxation induced by progesterone. This is accompanied by a decline in the rhythmic contraction of the ureter, an increase in the size of the ureter, and the application of pressure on the bladder, resulting in reduced emptying capacity. Consequently, there is increased urine output, which may contribute to urinary stasis (Aliya et al., 2018).

The clinical manifestations of urinary tract infections comprise an abrupt onset of fever, acute pain, nausea, vomiting, and occasionally cloudy urine. Diagnosis

and treatment planning necessitate the identification of the pathogen through urine culture. *Escherichia coli*, a bacterium that is found in 95% of cases of urinary tract infections during pregnancy, is the most prevalent uropathogen identified in urine culture (Balachandran et al., 2022).

Pregnant women who have been diagnosed with a urinary tract infection ought to be admitted into the hospital to receive initial empirical treatment for the purposes of identifying the pathogen and testing for antibiotic sensitivity. It has been established that empirical treatment options such as amoxicillin-clavulanate and cephalosporin are appropriate choices. Failure to treat cases of urinary tract infections may result in an elevated risk of both fetal and maternal morbidity, which includes complications such as fever, renal failure, preterm birth, and stillbirth (Carey et al., (2020).

The management of UTIs is a multifaceted process that necessitates a comprehensive understanding and adeptness in order to appropriately perceive and alleviate discomfort. Consequently, the involvement of nurses in prenatal initiatives denotes their clinical proficiency in recognizing both actual and potential complications throughout gestation. It can be justified

that nurses must continuously update their knowledge base (Clooney et al., 2019).

The development of care pathways has emerged as a highly regarded response to address concerns regarding the integration of evidence-based practice. These pathways are regarded as a procedural method for the decision-making and organization of care for a specific group of patients during a defined period, with the intention of enhancing the quality of care by improving patient outcomes, ensuring patient safety, increasing patient satisfaction, enhancing patient knowledge, and optimizing the utilization of resources. Additionally, care pathways have been recognized as valuable tools for evaluating clinical practice as a standardized approach to managing obstetric conditions through well-designed protocols. (Dawoud et al., 2023).

The objective of clinical pathways is to convert the recommendations outlined in clinical practice guidelines into clinical processes of care that are specifically designed to suit the distinctive culture and environment of a healthcare institution. A clinical pathway is an interdisciplinary care plan that possesses certain fundamental characteristics, including: (1) serving as a means to translate guidelines and evidence into local structures; (2) delineating the various stages involved in a course of treatment or care by employing a plan, pathway, algorithm, guideline, protocol, or other "inventory of actions"; and (3) aiming to establish uniformity in the provision of care for a particular clinical issue, procedure, or episode of healthcare within a specific population (Rotter et al., 2019).

Moreover, clinical pathways are a set of clinical interventions that have been documented, organized within a suitable temporal framework, and formulated and sanctioned by a multidisciplinary team. It is designed to facilitate a patient afflicted with a particular ailment or diagnosis as they navigate through a clinical encounter and ultimately achieve a desired outcome (Clooney et al., 2019).

Clinical pathways are frequently employed in high-risk care scenarios, aiming to enhance both maternal and neonatal outcomes. In the United States (US), the implementation of maternal and newborn clinical pathways resulted in improved inter-professional collaboration during care review. However, it did not have a significant impact on reducing costs or the length of stay (El-Razek, 2018).

### Significance of the study

The prevalence of UTIs in Africa varies from country to country and geographical location. For instance, in Ghana, the prevalence rate is 15.9%, in Senegal, it is 4.5%, and in Nigeria, it is 12.3%. Also, the prevalence of UTIs in Egypt ranged from 22 to 35%

in 2020 and increased to 53.5% in 2022. *E. coli* is the most common bacterium, causing 80–90% of community-acquired UTIs and 30–50% of nosocomial-acquired UTIs (Mohamed et al., 2022). The majority of cases of UTIs occur in the second and third trimesters, and they can lead to significant morbidity in pregnant individuals, exposing them to potential medical and obstetrical complications. Up to 20% of individuals with UTIs may experience complications, including septic shock syndrome or its variations, such as acute respiratory distress syndrome (Mwang'onde and Mchami, 2022).

If asymptomatic bacteriuria (ASB) is not diagnosed, there is a likelihood of urinary tract infection, with the prevalence reaching 40% in pregnant women. Urinary tract infection is linked with preterm labor, a pivotal factor in neonatal morbidity and mortality on a global scale (Dawoud et al., 2023). Thus, the primary responsibility of the maternity nurse is to avert preterm labor and enhance neonatal outcomes by executing informative sessions on urinary tract care and preventive measures for both mothers and fetuses during pregnancy and directly after childbirth.

### Aim of the study

To investigate the effect of implementing clinical pathways on maternity nurses' performance and birth outcomes among pregnant women with urinary tract infections

### Research hypotheses

H0 The maternity nurses who participate in clinical pathways sessions about urinary tract infection do not exhibit higher knowledge and performance scores after the implementation of clinical pathways than before.

H1 The maternity nurses who participate in clinical pathways sessions about urinary tract infection exhibit higher knowledge and performance scores after the implementation of clinical pathways than before.

H0 Pregnant women with urinary tract infections who underwent the clinical pathway intervention do not exhibit a better maternal and neonatal outcome than those who do not.

H1 Pregnant women with urinary tract infections who underwent the clinical pathway intervention exhibit a better maternal and neonatal outcome than those who do not.

### Operational definition

A clinical pathway is a care plan in which an intervention which based on best practice took place (detailed instruction of the best practice for facilitating the progress, monitoring and evaluating the necessary outcomes).

## Method

### Research design

A quasi-experimental methodology was employed, incorporating both a study group and a control group for the pregnant mothers and pre- and post-test for maternity nurses.

### Settings

The research investigation was carried out at the outpatient clinic of the obstetric department located at Menoufia University and Shebin EL-Kom Teaching Hospitals.

The choice of these particular settings was predicated on several factors. Firstly, they are public medical facilities that cater to a sizeable number of nurses from diverse geographical locations. Additionally, there is a considerable influx of women from both rural and urban areas that are in proximity to Shebin El Kom. Moreover, these settings offer complimentary services to the general public and provide specialized care to women throughout their pregnancy and delivery.

### Sampling

A convenience sample of 40 staff nurses was recruited from the obstetric department of the study setting. Additionally, 100 pregnant mothers were chosen. The participants were then divided into two equal groups, ensuring equal distribution. The first group, referred to as the study group, included 50 mothers who received clinical pathways during the second trimester of pregnancy. The second group, known as the control group, consisted of 50 mothers who did not receive clinical pathways.

### Inclusion criteria

1. **Nurses:** All maternity nurses working at the obstetrics and gynecological departments of the study settings.
2. **Women:** pregnant women with urinary tract infections during their first or second trimesters, no underlying medical or obstetric concerns, and a willingness to participate in the research.

### Sample size calculation

The determination of sample size was conducted with a statistical power of alpha 0.05 and beta 0.8, thereby necessitating the introduction of a constant Z value of 1.96. Through the application of the formula  $N = Z^2PQ/D^2$ , a sample size of 100 pregnant women was deemed appropriate for the study according to the inclusion criteria for these women stated that they had been medically diagnosed with a urinary tract infection, were between 20 and 36 weeks pregnant, and had no prior history of chronic conditions such as diabetes, hypertension, heart disease, or anemia. This

calculation is based on the incidence of UTIs, which ranges from 0.5 to 2% among pregnant women, with up to 23% of them experiencing a recurrence during the same pregnancy, as reported by Pal et al. (2017). In this formula, N denotes the required sample size, P represents the proportion of individuals affected, Q represents the proportion of those not affected, and D relates to the sampling error. Thus, to achieve the desired statistical power, the introduction of a constant Z value is crucial, with a value of 1.96 being the optimal choice.

### Instruments of data collection

The present study employed three instruments for data collection:

1. **An interview questionnaire** was utilized to gather information from the study participants. This questionnaire was composed of two distinct parts:

**Part one:** It used to gather socio-demographic information about the pregnant mothers, including age, educational level, occupation, and residence.

**Part two:** was dedicated to evaluating the obstetric history of the pregnant mothers, encompassing vital information pertaining to parity, instances of abortion, the number of children currently alive, past utilization of contraceptive methods, attendance at antenatal appointments, and any previous occurrences of urinary tract infections during pregnancies.

II. **Assessment instrument** was utilized for assessing the socio-demographic information, maternity nurses' level of knowledge, and practice regarding the symptoms of UTIs. This instrument was composed of three distinct parts:

**Part one:** The primary focus was on evaluating the socio-demographic information of the maternity nurses, such as age, marital status, educational level, job description, years of experience, and possession of any knowledge pertaining to the implementation of the clinical pathway.

**Part two:** Assessment tool for assessing the maternity nurses' level of knowledge regarding the symptoms of UTIs (pre & post-test) including: pain during urination, painful intercourse, feeling urgent while urinating, burning sensation during urination, change in color and smell, pain below the abdomen high temperature, nausea, some vaginal secretion, swelling of the foot.

### Scoring system

Each item of the level of knowledge was given a score; yes, it was scored (2), whereas no, it was scored (1). The total knowledge score was calculated by summing up the scores for the "yes items". The scores were converted into percentages. The higher scores reflected higher levels of knowledge regarding UTIs. The total knowledge score was indicated as the

following: Good: >75% of total knowledge score; average: 75%→ 50% of total knowledge score; and poor if the percent score was less than 50%.

**Part three:** A questionnaire for assessing the maternity nurses' level of practice towards the ways to relieve symptoms of urinary tract infections, (pre & post-test) including: drinking plenty of fluids (2–3 liters), drinking cherries or juice, reducing substances containing sugar or caffeine, urinating when you feel the desire immediately, urinating before and after intercourse, avoiding intercourse at the time of treatment, keeping the perineum dry and clean, changing underwear once or twice per day, and underwear should be made of cotton and not tight.

### Scoring system

A score of 2 was given for each performed practice and 1 for each not performed practice. The scores of the items were summed up, and the total was divided by the number of questions, giving a mean score. These scores were converted into percent scores. The higher scores reflected a satisfactory level of practice. The total score was indicated as follows: satisfactory  $\geq 50\%$  of the total practice score and unsatisfactory if less than 50%.

### III. An Observation Checklist for birth outcomes:

It includes two parts:

**Part one: Maternal Outcomes:** The variables being examined comprise the duration of the initial phase of labor, the administration of oxytocin with respect to cervical dilation, the duration of the subsequent stage, the mode of delivery, and the interval between hospital admission and delivery.

**Part two: Neonatal Outcomes:** The evaluation of neonatal outcomes is a crucial aspect of this study. To ensure accurate measurement, the researcher has developed a tool after conducting an extensive review of relevant literature. The tool includes measurement of neonatal outcomes through the Apgar score at 1 and 5 minutes, birth weight, and admission to the neonatal intensive care unit (NICU). Breastfeeding variables have also been incorporated into the checklist. These variables comprise the infant's ability to take the breast and suckle in the delivery room and in the 12 hours following delivery.

### Validity

The process of preparing and verifying the content and validity of the questionnaire was carried out by a group of five esteemed professionals. This group is comprised of three individuals who are affiliated with the Maternal and Newborn Health Nursing department at the esteemed Faculty of Nursing, Menoufia University and two esteemed professors from the Obstetrics and Gynecology department, Menoufia University at the prestigious Faculty of Medicine. Necessary modifications were made to

verify the relevance and comprehensiveness of the content, as well as the clarity of the hypotheses.

### Reliability

The researcher endeavored to ascertain the dependability of the tool by employing the test-retest reliability measure, specifically with the aim of evaluating the internal coherence of the instruments. This was achieved by administering the identical instruments to indistinguishable participants under comparable circumstances in two or more instances. The findings were subsequently juxtaposed, offering valuable discernment into the suitability and trustworthiness of the instrument. All dimensions in the instruments were internally reliable, with Cronbach's  $\alpha$  scores ranging from 0.75 to 0.90 for instrument II and 0.86 for instrument III.

### Pilot study

A pilot investigation was undertaken with the aim of validating the appropriateness of the utilized tools, evaluating the feasibility of the research endeavor, and estimating the time needed to acquire the necessary data. This initial examination was carried out on a representative subset of the complete sample, consisting of 10% (4 nurses and 10 pregnant women). The results of the pilot study influenced the researcher's decision to reword certain inquiries and statements, as well as to finalize the fieldwork schedule. The sample utilized in the pilot study was explicitly excluded from the primary research sample.

### Ethical considerations

A written endorsement was obtained from the ethical and research committee of the Faculty of Nursing at Menoufia University, encompassing the study's title and objectives, and subsequently presented to the directors of the aforementioned settings. In order to protect the rights of women, oral consent was acquired from the participants after a comprehensive explanation of the study's objectives, which included ensuring no harm would be inflicted upon the participants, avoiding any conflicts with cultural, traditional, and religious beliefs, upholding human rights, and upholding the confidentiality of the data, primarily for research purposes.

### Approval letters

The research and ethical committees granted approval for the study to be conducted. A formal letter from the Faculty of Nursing at Menoufia University was submitted to both the university hospital and the teaching hospital. The directors of the aforementioned settings provided official permission for the study to proceed. Each female participant was duly informed that their involvement

in the study was voluntary and that they possessed the liberty to withdraw their participation at any given moment. Furthermore, they were afforded the opportunity to decline participation without any subsequent ramifications. All participants were actively encouraged to pose any questions they may have pertaining to the study's particulars.

### Study procedure

An exhaustive examination pertaining to the study domain was conducted, encompassing digital theses, accessible literature, and published works. Additionally, a thorough review of the literature was undertaken in order to establish a knowledge base that is pertinent to the study field. The segment dedicated to the literature review was scrutinized by plagiarism detection software.

Data collection was carried out for the current study between the time frames of September 2022 and March 2023. In the initial stages, the researcher thoroughly examined the population of female subjects to identify individuals who met the criteria for inclusion. Subsequently, the researchers visited the outpatients of University Hospital twice every week, specifically on Sunday and Monday, for a duration of eight weeks, and selected the women as per their availability for an interview, with an average of 2-3 interviews conducted per day. Following this, the researchers visited the Teaching Hospital twice every week, specifically on Tuesday and Thursday, from 9 a.m. to 12 p.m., and conducted an average of 1-2 interviews with women per day. However, some women were not regular with their visits, and thus their contact numbers were taken to inquire about any changes or improvements in their condition and to inform the researchers about their delivery and their newborns.

Additionally, the researchers obtained data from the nurses in order to evaluate their comprehension of UTIs (using instrument II pre-test). Then, provide knowledge sessions to enhance their competence in managing pregnant women who have been diagnosed with UTIs. The researchers conducted four sessions, with each session consisting of five nurses. Subsequently, a post-test using instrument II was administered to assess the effectiveness of these sessions on the nurses' knowledge and performance regarding UTIs.

The initial encounter with the female participants occurred in the outpatient clinic during scheduled follow-up and detection appointments for educational sessions. The researcher introduced herself to the participants and provided an oral elucidation of the aim of the study. All participants were given verbal consent, wherein each person was informed that their involvement was optional and they had the

prerogative to discontinue their participation at any point. The interview process was conducted with each woman to obtain data regarding their socio-demographic characteristics and any indications or symptoms experienced during pregnancy.

Throughout the educational sessions, the researchers offered a simplified oral elucidation of the investigation, addressing any queries raised by the female participants in relation to UTIs and imparting guidance on how to effectively manage any symptoms. Each session comprised a cohort of five women, lasting approximately between one and two hours. The researcher executed two sessions per week, one at Menoufia University Hospital and the other at Shebin El-Kom Teaching Hospital, culminating in a total of ten sessions conducted over a span of five weeks. These instructional sessions were solely administered to the study group, which was comprised of 50 women. Conversely, the other cohort of women (50) were solely evaluated for their comprehension pertaining to UTIs, with no accompanying directives furnished. The researchers gathered the data from the study group subsequent to the implementation of the clinical pathways. The goal was to assess the consequential effects of the knowledge sessions on the birth outcomes and the health of the newborns.

### Statistical analysis

Data was gathered, organized, and subjected to statistical analysis using an IBM personal computer equipped with the Statistical Package of Social Science (SPSS) version 25 (SPSS, Inc., Chicago, Illinois, USA). In this analysis, the following statistical measures were employed:

- For descriptive statistics, quantitative data were represented by their mean, standard deviation (SD), and range, while qualitative data were expressed as numbers and percentages.
- Analytical statistics are employed to determine the potential association between the examined factors and the targeted disease.
- Shapiro-Wilk test of normality, which aimed to establish whether the data adhered to a normal distribution or not.
- Chi square test (X<sup>2</sup>) was implemented as a means of comparing groups with qualitative variables in terms of their significance.
- T-test, on the other hand, served as a test of significance to compare two groups that were normally distributed and characterized by quantitative variables.
- McNemar test constituted a test of significance used to compare two associated groups that possessed qualitative variables.

- Marginal homogeneity test evaluated the significance of the disparity between three correlated proportions.

A P value greater than 0.05 was deemed to be statistically insignificant.

A P value less than 0.05 was deemed to be statistically significant.

A P value less than 0.001 was deemed to be statistically highly significant.

## Results

**Table (1):** displays the socio-demographic information of the nurses who underwent examination. The ages of these nurses varied from 23 to 39 years, with an average age of 30.5 and a standard deviation of 3.60. Around 45% of the nurses obtained their degree from a nursing faculty, while 40% possessed a diploma in nursing. Moreover, the majority of the nurses, constituting 65%, possessed knowledge regarding the implementation of clinical pathways. They acquired this knowledge through various means, including training courses (38.5%), the internet (38.5%), and lectures (23%).

**Table (2):** presents a comparison of the knowledge of nurses regarding the symptoms of urinary tract infections before and after participating in knowledge sessions. The findings suggest that there existed noteworthy disparities in their understanding subsequent to the implementation of the clinical pathway, with a P value of 0.001. The indications that were recognized encompass discomfort during urination, a fiery feeling during urination, certain vaginal excretion, an impression of urgency while urinating, inferior abdominal pain, alterations in the hue and odor of the urine, an elevated body temperature, pain during sexual intercourse, queasiness, and inflammation of the foot.

**Table (3):** shows a comparison between the nurses practice and the ways to relieve the symptoms of UTIs prior to and subsequent to their participation in educational sessions. This analysis reveals noteworthy disparities in the execution of these techniques by healthcare professionals regarding ways to relieve symptoms of urinary tract infections after implementing clinical pathways such as drinking a lot of fluids (2–3 liters) daily, keeping the perineal area clean and dry, changing the underwear daily, wearing cotton underwear that is not tight, urinating immediately while feeling the desire of urination, urinating before and after intercourse, avoiding intercourse at the time of treatment, and reducing substances that contain sugar or caffeine.

**Figure (1):** displays the total knowledge scores of the maternity nurses about the symptoms of urinary tract infections before and after the clinical pathways' application. It shows that 40% of the maternity nurses

displayed good knowledge scores before the clinical pathways' application. However, this percentage increased significantly to 75% subsequent to the application of clinical pathways.

**Figure (2):** displays the total practice scores of the maternity nurses towards the ways to prevent urinary tract infections before and after the clinical pathways' application. It shows that 6% of the maternity nurses displayed satisfactory practice scores before the clinical pathways' application. However, this percentage increased significantly to 92% subsequent to the application of clinical pathways.

**Table (4):** demonstrates that the age range of both the study cohort (88%) and control cohort (96%) is situated within the 25–30-year range. Moreover, no statistically significant disparities were detected between the two cohorts pertaining to their educational attainment, profession, or place of residence. Nevertheless, it is noteworthy that in the study group, nearly half (48%) had completed secondary school, and the majority (52%) were employed. In contrast, the control group exhibited a higher percentage of individuals who had completed both secondary and university education, and the majority (56%) were employed.

**Table (5):** presents a comparative examination between the study group and control group in relation to their evaluation during childbirth, which encompasses a significant difference between the study and the control groups regarding the maternal outcomes observed immediately following delivery, which clarifies the effect of implementing clinical pathways on maternal outcomes among pregnant women with urinary tract infections. It is worth noting that the initial stage of labor for the majority of participants was less than eight hours, and a considerable number of them underwent a caesarean section. Nevertheless, there were distinct disparities in the primary reason for caesarean sections between the two groups. Specifically, the study group primarily consisted of individuals who had previously undergone a caesarean section, whereas rupture of the membrane emerged as the predominant cause in the control group.

**Table (6):** demonstrates that there are significant disparities between the study and the control groups regarding the neonatal outcomes observed immediately following delivery in terms of weight, need for PICU, time of starting breastfeeding, and has breastfeeding started well? This clarifies the effect of implementing clinical pathways on maternal outcomes among pregnant women with urinary tract infections. The infants belonging to the two groups in relation to the APGAR score acquired promptly after birth, which varied between 7 and 10, and the weight, which varied between 2 and 4.5 kilograms. The

majority of the newborns do not require admission to an intensive care unit, and a substantial proportion of

them commence breastfeeding within the initial 12 hours subsequent to delivery.

## Results

**Table 1: Socio-demographic attributes of the nurses under study (N = 40)**

Variables	No.	%
<b>Age (years)</b>		
Mean $\pm$ SD	30.5 $\pm$ 3.60	
Range	23–39	
<b>Marital status</b>		
Married	40	100
<b>Educational level</b>		
Diploma in nursing	16	40.0
Institute of Nursing	6	15.0
Faculty of nursing	18	45.0
<b>Job description</b>		
Nursing technician	22	55.0
Nursing specialist	12	30.0
Nursing supervisor	6	15.0
<b>Years of experience</b>		
Less than 2 years	8	20.0
2–5 years	14	35.0
5–10 years	6	15.0
>10 years	12	30.0
<b>Do you possess any knowledge pertaining to the implementation of the clinical pathway?</b>		
Yes	26	65.0
No	14	35.0
<b>If yes, where did you get the information?</b>		
Lectures		
Training courses	6	15.0
Internet	10	25.0
	10	25.0

Table 2: Level of knowledge of the maternity nurses about the symptoms of urinary tract infections (N = 40)

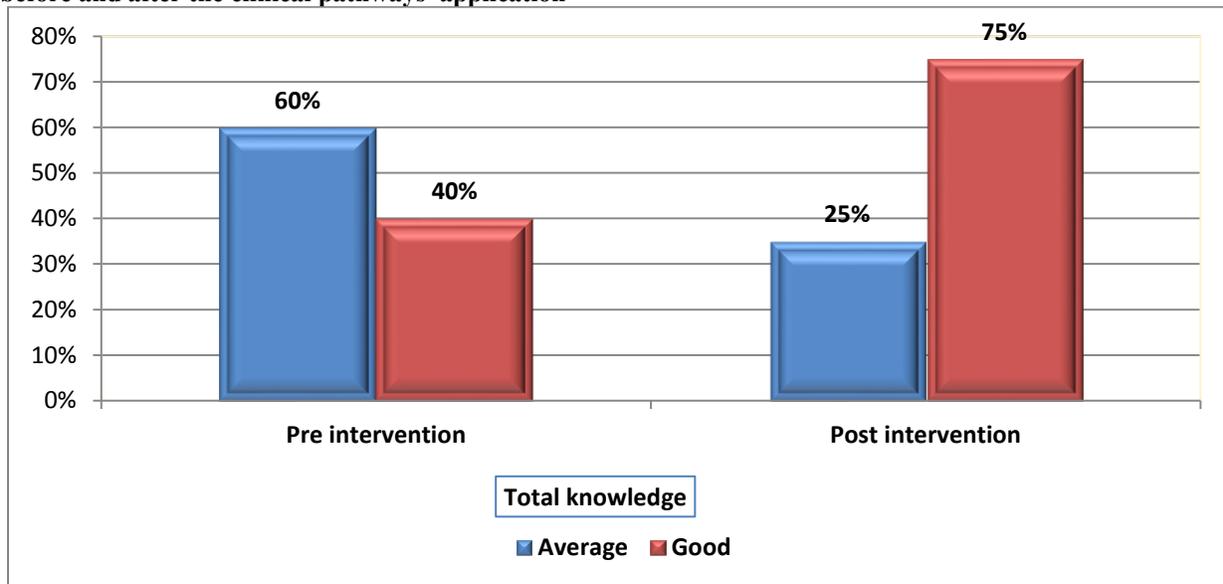
Variables	Pre test		Post test		X2	P value
	No.	%	No.	%		
<b>Pain during urination</b>						
Yes	40	100	40	100	a	A
No	0	0.00	0	0.00		
<b>Painful intercourse</b>						
Yes	10	25.0	26	65.0	6.46	<b>0.011*</b>
No	30	75.0	14	35.0		
<b>Feeling urgent while urinating</b>						
Yes	20	50.0	34	85.0	5.58	<b>0.018*</b>
No	20	50.0	6	15.0		
<b>Burning sensation during urination</b>						
Yes	30	75.0	38	95.0	3.14	0.076
No	10	25.0	2	5.00		
<b>Change in urine color and smell</b>						
Yes	14	35.0	28	70.0	4.91	<b>0.026*</b>
No	26	65.0	12	30.0		
<b>Pain below the abdomen</b>						
Yes					8.64	<b>0.003**</b>
No	16	40.0	34	85.0		
	24	60.0	6	15.0		
<b>High temperature</b>						
Yes	18	45.0	26	65.0	1.62	0.203
No	22	55.0	14	35.0		
<b>Nausea</b>						
Yes	8	20.0	14	35.0	1.13	0.288
No	32	80.0	26	65.0		
<b>Some vaginal secretion</b>						
Yes					11.9	<b>0.001**</b>
No	18	5.0	18	95.0		
	22	55.0	2	5.00		
<b>Swelling of the foot</b>						
Yes	4	10.0	28	70.0	15.0	<b>0.001**</b>
No	36	90.0	12	30.0		

\* a means the variable is constant

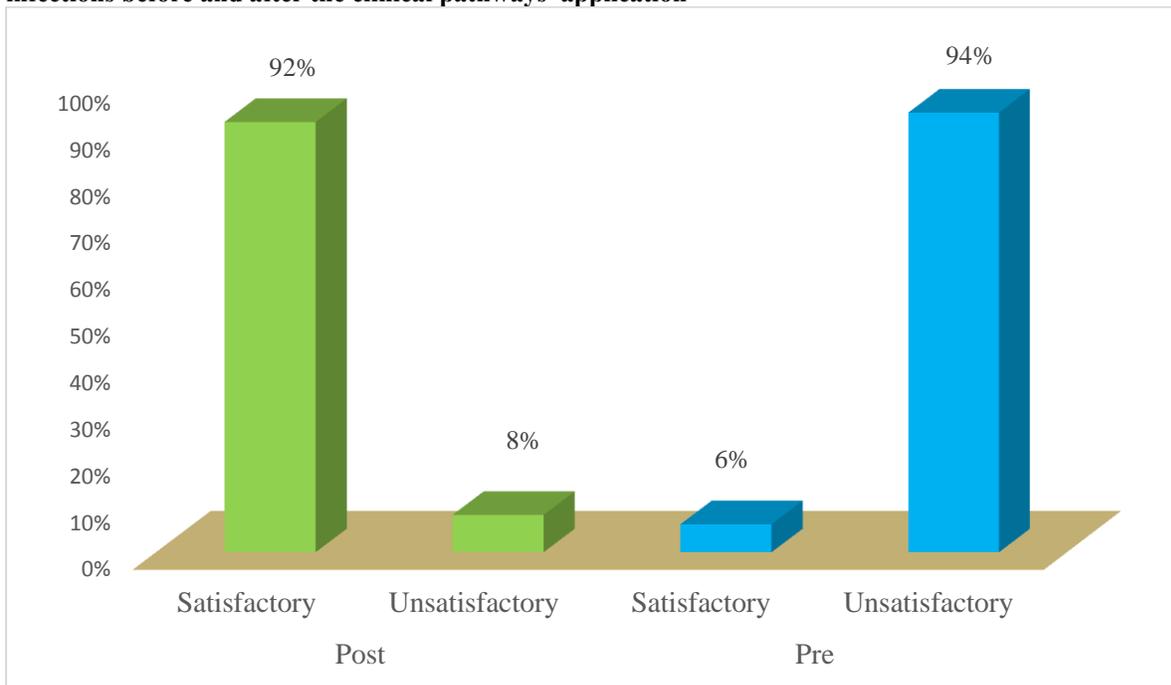
Table 3: Level of practice of the maternity nurses towards the ways to relieve symptoms of urinary tract infections (N = 40)

Variables	Pre test		Post test		McNemar test	P value
	No.	%	No.	%		
<b>Drinks plenty of fluids 2-3 liters per day</b>	20	50.0	40	100	13.3	<b>0.001**</b>
Yes	20	50.0	0	0.00		
No						
<b>Drink cherries or juice.</b>					5.01	<b>0.025*</b>
Yes	16	40.0	30	75.0		
No	24	60.0	10	25.0		
<b>Reduce substances containing sugar or caffeine.</b>					6.67	<b>0.009**</b>
Yes	16	40.0	34	80.0		
No	24	60.0	8	20.0		
<b>Urinate when you feel the desire immediately.</b>					4.29	<b>0.038*</b>
Yes	22	55.0	34	85.0		
No	18	45.0	6	15.0		
<b>Urinating before and after intercourse</b>					1.67	0.196
Yes	20	50.0	28	70.0		
No	20	50.0	12	30.0		
<b>Avoid intercourse at the time of treatment.</b>					5.01	<b>0.025*</b>
Yes	10	25.0	24	60.0		
No	30	75.0	16	40.0		
<b>Keep the perineum dry and clean.</b>					13.3	<b>0.001**</b>
Yes	20	50.0	40	100		
No	20	50.0	0	0.00		
<b>Changing underwear once or twice per day</b>					24.0	<b>0.001**</b>
Yes	10	25.0	40	100		
No	30	75.0	0	0.00		
<b>Underwear should be made of cotton and not tight.</b>					7.45	<b>0.006**</b>
Yes	26	65.0	38	95.0		
No	14	35.0	2	5.00		

**Figure 1: The total knowledge scores of the maternity nurses about the symptoms of urinary tract infections before and after the clinical pathways' application**



**Figure 2: The total practice scores of the maternity nurses towards the ways to prevent urinary tract infections before and after the clinical pathways' application**



**Table 4: Socio-demographic attributes of the pregnant women under examination (N = 100)**

Variables	Study group (N=50)		Control group (N=50)		X <sup>2</sup>	P value
	No.	%	No.	%		
<b>Age (years)</b>					FE	
25 – 30	44	88.0	48	96.0	1.08	0.609
> 40	6	12.0	2	4.00		
<b>Educational level</b>					1.73	0.629
Illiterate	2	4.00	0	0.00		
read and write	6	12.0	10	20.0		
Secondary	24	48.0	20	40.0		
University	18	36.0	20	40.0		
<b>Occupation</b>					0.081	0.777
Working	26	52.0	28	56.0		
Not working	24	48.0	22	44.0		
<b>Residence</b>					0.347	0.556
Urban	20	40.0	16	32.0		
Rural	30	60.0	34	68.0		

FE: Fisher exact test

**Table 5: Maternal outcomes observed immediately following delivery within the study and control groups (N = 100)**

Variables	Study group		Control group		X <sup>2</sup>	P value
	No.	%	No.	%		
<b>Duration of the first stage of delivery</b>						
< 8 hours	40	80.0	22	44.0	9.30	<b>0.010*</b>
8 – 12 hours	10	20.0	16	32.0		
> 12 hours	0	0.00	12	24.0		
<b>Duration of the second stage of delivery</b>					-	-
Less than 20 minutes	50	100	50	100		
<b>Type of delivery</b>					0.104	0.01
Vaginal	14	28.0	12	24.0		
Caesarian	36	72.0	38	76.0		
<b>Causes of caesarian delivery</b>	<b>N=36</b>		<b>N=38</b>			
Rupture of membrane	8	22.2	12	31.5	9.64	0.04
Oligohydramnios	4	11.1	2	5.30		
Previous C.S	20	55.6	8	21.0		
Wrap the umbilical cord around fetus	4	11.1	2	5.30		
Bleeding	0	0.00	6	15.8		
Preeclampsia	0	0.00	6	15.8		
Twin	0	0.00	2	5.30		

\*Significant

**Table 6: Neonatal outcomes observed immediately following delivery within the groups under study (N = 100)**

Variables	Study group		Control group		X2	P value
	No.	%	No.	%		
<b>APGAR score</b>					t	
Mean $\pm$ SD	9.76 $\pm$ 0.83		9.72 $\pm$ 0.79		0.391	0.695
Range	7-10		7-10			
<b>Weight in Kg</b>					t	
Mean $\pm$ SD	3.20 $\pm$ 0.36		3.10 $\pm$ 0.50		1.10	0.02
Range	2-4.50		2-4.00			
<b>Need for PICU</b>					FE	
Yes	2	8.00	3	12.0	0.22	0.01
No	23	92.0	22	88.0		
<b>Time of starting breastfeeding</b>						
After birth						
Within 12 hours after birth	13	52.0	5	20.8	1.48	0.03
After 12 hours	7	28.0	9	37.5		
	5	20.0	10	41.7		
<b>Has breastfeeding started well?</b>					FE	
Yes					0.35	0.05
No	24	96.0	23	92.0		
	1	4.00	2	8.00		

\* FE: Fisher exact test

## Discussion

The current study aligns with the discoveries of Godbole et al. (2020), who noted that nursing teams continue to have insufficient understanding regarding UTIs. It is widely recognized that nurses bear a substantial obligation in the management of infections and the numerous elements linked to it for the purpose of delivering superior care, consequently underscoring the necessity for meticulousness in infection management. They demonstrate that there exists a notable disparity in the knowledge of nurses regarding UTIs after the clinical pathways' sessions administered.

The current investigation has demonstrated that the predominant population of women under scrutiny (comprising both study and control groups) falls within the age range of twenty to thirty years old. It is also noteworthy that almost fifty percent of the study group and approximately one-third of the control group possess a secondary school education. Furthermore, nearly one-half of the women under investigation (belonging to both study and control groups) engage in regular employment or have a personal income. These findings may be attributed to the fact that the women under examination are of childbearing age and thus vulnerable to UTIs during pregnancy.

These outcomes are consistent with Nguefack et al.'s study (2019), which revealed that more than two-

thirds of pregnant females suffering from UTIs are within the age range of twenty-three and thirty-two. Moreover, the study indicated that the majority of these females have achieved a secondary education, with half of them involved in employment. This result is further substantiated by Lu (2022)'s study (2022), which established that the greater percent of females diagnosed with UTIs fall within the age bracket of twenty to thirty years old, while the minority belong to the age group exceeding thirty years. In addition, Shahreen (2020) demonstrated that one-third of expectant females affected by UTIs were observed to be in the age range of twenty to thirty years old.

Likewise, Hoffmann et al. (2020) have reported that a significant proportion of women diagnosed with UTIs fall within the age range of twenty-five to thirty-five years. Interestingly, more than two-thirds of these women were identified as housewives. In contrast, Serenac et al. (2020) have reported that one-third of women diagnosed with UTIs were aged between thirty-one and forty years. Meanwhile, Levi et al. (2018) have stated that UTIs are more commonly observed in elderly women from lower socioeconomic backgrounds. Additionally, McKertich and Hanegbi (2021) has reported that a majority of pregnant women diagnosed with UTIs were aged between thirty-six and forty years.

The current investigation has provided evidence that the majority of the two groups gave birth multiple times. Furthermore, they initiated their initial visit either towards the conclusion of the first three months of pregnancy or at the beginning of the second three months. In addition, it was observed that most of them had no previous experience of miscarriage, while less than one-half of the study and control groups had a past occurrence of UTIs. This finding is supported by Richmond et al. (2021), who discovered that a large proportion of pregnant women with UTIs at the time of diagnosis were in the second trimester of pregnancy. Also, this aligns with Moore et al. (2018), who established that this observation is connected to the peak period of reduced urine flow and changes in the immune system in the urinary tract as a result of hormonal influence.

Also, the outcomes of this investigation align with the findings of Olsen et al. (2018), who found that a significant proportion of the women surveyed were multiparous and had not undergone any previous abortions. Moreover, this result is consistent with Taghavi et al.'s study (2020), which demonstrated that more than half of the surveyed participants were multigravida and had not undergone an abortion.

Furthermore, Persson et al. (2018) reported that a history of UTIs and multiparity were identified as risk factors for UTIs in this sample. Ahn et al. (2020) similarly found that a history of UTIs before conception was correlated with an elevated likelihood of experiencing UTIs. In addition, Hoffmann et al. (2020) documented that a history of UTIs before conception served as a prognostic predictor for the onset of bacteriuria during pregnancy.

The present investigation has reported a significant improvement in the process of childbirth subsequent to the implementation of the clinical pathways. This outcome indicated that the majority of expectant mothers with UTIs experienced a first-stage duration of less than 8 hours. The findings of the current study have also demonstrated that the provision of continuous care through clinical pathway application prior to and during childbirth has a strong influence on the childbirth experience.

In addition, El Razek et al. (2018) discovered that the group receiving the intervention exhibited a noteworthy enhancement in their understanding of the childbirth process and its supportive measures subsequent to exposure to the clinical pathway. This discovery aligns with Smaill et al.'s study (2019), which revealed that utilization of various supportive measures, such as the technique of bearing down, enabled trained mothers to alleviate pain and instill a sense of control and confidence among mothers, thereby facilitating effective and efficient pushing.

The ongoing investigation has revealed that the weight of infants in the experimental group, ranging from two to four and a half kg, did not necessitate intensive care. Furthermore, their APGAR scores were within a range of seven to ten. The results of this current study have shown that there is a positive impact on the outcomes of newborns, which align with normal APGAR scores. These findings are consistent with McKertich and Hanegbi's (2021), where it was discovered that the prevalence of low birth weight was six-point seven percent. Moreover, it was determined that this percentage may be attributed to enhanced monitoring following the treatment of UTIs.

The investigation, additionally substantiated by Richmond et al. (2021), revealed that the incidence of low birth weight (LBW) was merely three percent among the subjects under scrutiny. Moreover, the study found that UTIs are a major contributing factor to preterm labor and LBW. Versi et al. (2018) additionally documented a positive association between UTIs and preterm labor, low birth weight, hypertension, preeclampsia, maternal anemia, and amonites. Moreover, Smyth et al. (2018) elaborated on the fact that pregnant individuals afflicted with UTIs are more inclined to experience premature childbirth and give birth to infants with low birth weight, ultimately leading to preterm delivery.

Contrarily, Tracey and colleagues (2019) have recorded a significant discrepancy in Apgar scores between the group that underwent the clinical pathway intervention and the control group. This observation aligns with the results of Weber et al. (2018), who observed that newborns experienced notable advantages from maternal assistance during childbirth and were admitted to intensive care units less frequently.

## Conclusion

These findings have led to the conclusion that the maternity nurses who participate in clinical pathways sessions about urinary tract infection exhibit a higher knowledge and performance scores after implementation of clinical pathways than before. Furthermore, the present study findings revealed that the pregnant women with urinary tract infection who underwent the clinical pathways intervention exhibit a better maternal and neonatal outcome than those who do not.

## Recommendations

According to the results of the present study, several recommendations have been proposed.

1. It is advisable to enhance the quality of healthcare delivered at the community level. This objective can be accomplished by carrying out regular screenings

of expectant mothers to detect any indications of infection, thereby facilitating the early identification of diseases.

2. The raising of women's awareness is of paramount importance and can be attained by employing booklets in outpatient clinics. These booklets can encompass information pertaining to physiological changes experienced during pregnancy, manifestations and indications of urinary tract infections, as well as measures to mitigate these symptoms.

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