



# Asymptomatic Bacteriuria in Pregnancy: A Concept Analysis

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## Abstract

Asymptomatic bacteriuria is one of the most common infections that pregnant women experience. If this condition is undiagnosed or untreated early, an infected pregnant woman may develop pyelonephritis. Pyelonephritis in pregnancy often leads to premature birth, a leading cause of neonatal deaths worldwide. This loss of potential lives of new-borns result in sad and traumatic experiences by an expecting couple, family and community. This article assesses the operational definition for asymptomatic bacteriuria in pregnancy as it is provided in several articles that were cited. Walker and Avant's traditional method of concept analysis was used in this analysis. This approach is founded on realism, where concepts are viewed as static entities, with clear and distinct boundaries. The aims of this analysis were to clarify and increase an understanding about asymptomatic bacteriuria in pregnancy. Analysis of the concept was useful in determining defining attributes, antecedents and consequences of asymptomatic bacteriuria in pregnancy. Definitions of asymptomatic bacteriuria were extracted from dictionaries including the Mac Graw- Hill Concise Dictionary, Merriam Webster and Medical Dictionary. Published research articles by Saquib et al., (2002), Ruben et al., (1992), Imade et al., (2010), Frayne, (2011), Platt, (1983) and Muharram et al., (2012) provided useful definition of the concept. Several published articles including those by Manjula et al., (2016), Smail, (2007), Stein and Funfstuck (2000) and Ozyurek and Usta (2013) were useful in the clarification of perspective of asymptomatic bacteriuria in pregnancy. There is need for Nurses to have an understanding of asymptomatic bacteriuria in pregnancy as it is of primary concern to nursing practice, research and education.

**Keywords:** Asymptomatic bacteriuria, bacteriuria, pyelonephritis, screening, preterm birth, and concept analysis

## INTRODUCTION

Pregnant women often encounter infections which lead to adverse birth outcomes (Gilbert et al., 2013). Among the urinary tract infections that commonly occur in pregnancy and of primary concern is asymptomatic bacteriuria (Stein and Funfstuck, 2000). Asymptomatic bacteriuria is defined as the significant presence of bacteria in the urine of an individual without any symptoms of urinary infection (Imade et al., 2010). Asymptomatic bacteriuria is a subclinical bacterial urinary tract infection which is associated with adverse foetal and maternal outcomes that may occur during pregnancy or during puerperium (Siakwa et al., 2014).

This is the most common bacterial infection that requires medical attention during pregnancy. Globally a prevalence of 2% to 10% of asymptomatic bacteriuria is reported among pregnant women (Manjula et al., 2016). In developing countries including countries in Africa asymptomatic bacteriuria is common with prevalence as high as 35% (Siakwa et al., 2014). The prevalence levels also vary from country to country (Siakwa et al., 2014).

If not diagnosed early, untreated asymptomatic bacteriuria in pregnancy is associated with adverse maternal and perinatal outcomes (Perera et al, 2012). Asymptomatic bacteriuria is often associated with preterm birth, a leading cause of neonatal mortality (Manjula et al., 2016). It is due to this complication that asymptomatic bacteriuria is

referred to as a complicated urinary tract infection (Bryan, 2015).

Asymptomatic bacteriuria during pregnancy requires early diagnosis and medical treatment (Jain et al., 2013). Screening of pregnant women for asymptomatic bacteriuria by a urine culture is recommended at 12 to 16 weeks gestation or at first antenatal visit (U.S Preventive Services Task Force (2008). Screening and treatment of asymptomatic bacteriuria is recommended by the United States Preventive Services Task Force, Infectious Disease Society of America, the Canadian Task Force on Preventive Care, the Scottish Intercollegiate Guidelines Network, the European Association of Urology, and the National Collaborating Centre for Women's and Children's Health of the National Institute for Health and Clinical Excellence (Gilbert et al., 2013).

Urine culture is reported to be the gold standard for detecting asymptomatic bacteriuria (Gilbert et al., 2013). The challenge with this test for routine screening is that it is costly and not a rapid test (U.S Preventive Services Task Force, 2008). Currently, screening tests commonly used include dipstick and direct microscopy but these tests have poor positive and negative predictive values (Abdullahi and Thairu, 2015).

The bacteria causing asymptomatic bacteriuria are often sensitive to antibiotics including nitrofurantoin, amoxicillin, ceftriaxone, norfloxacin and cephalexin (Manjula et al., 2016).

Concept analysis is a concept development method, a process of determining the likeliness and unlikeliness between concepts and its basic purpose. It distinguishes between the defining attributes of a concept and its irrelevant attributes (Walker and Avant, 2005). Concept analysis is an activity whereby concepts belonging to a whole, their characteristics and relations they hold within systems of concepts are clarified and described (Nuopponen, 2010).

In this article the concept of asymptomatic bacteriuria in pregnancy will be analysed. This concept is not well described and understood in nursing. Studies and analysis of this concept by nurses is lacking.

## **Significance to Nursing**

Nurses are the first line health care professionals to come into contact with pregnant women and hence their awareness regarding asymptomatic bacteriuria is of primary concern considering the adverse pregnancy outcome of preterm birth that it is associated with. Health promotion activities by nurses with regards to asymptomatic bacteriuria prevention, its early diagnosis and treatment is also of primary concern. However the concept is not well understood as most Nurses relate it to a medical issue for Doctors and Medical Laboratory Scientists. An understanding of this concept is required especially by Nurses so that preventive measures can be taken, cases diagnosed early and appropriate and effective treatment provided.

## **Purpose**

The purpose of this analysis is to clarify the concept of asymptomatic bacteriuria in relation to its occurrence in pregnancy.

## **Objectives**

The objectives of this analysis includes the following:

- To determine the internal structure of asymptomatic bacteriuria in pregnancy by breaking it down into simpler elements.
- To clarify the defining attributes of asymptomatic bacteriuria in pregnancy.
- To promote mutual understanding among colleagues concerning asymptomatic bacteriuria in pregnancy.
- To determine the antecedents and consequences of asymptomatic bacteriuria in pregnancy.
- To distinguish normal, ordinary, and scientific language on the usage of the concept asymptomatic bacteriuria in pregnancy.
- To help with tool development in relation to assessment for asymptomatic bacteriuria in pregnancy.

## **MATERIALS AND METHODS**

Walker and Avant's traditional method of concept analysis was used in this analysis. This method of concept analysis involves observing the following steps, selection of a concept, determining purpose of analysis, identifying all uses of concept, determining defining attributes, constructing model case and additional cases including borderline, related, contrary, invented and illegitimate, identifying antecedents and consequences and defining empirical referents.

Asymptomatic bacteriuria in pregnancy was identified and selected for analysis in this article. A model case was presented as all the defining attributes were tied to it. Borderline and related cases were also presented which helped to differentiate asymptomatic bacteriuria in pregnancy from other concepts. Empirical referents demonstrate

the current perspective of the concept of asymptomatic bacteriuria.

Data was gathered from online dictionaries and published articles from Google Scholar, Google and PubMed. A total of 54 published articles were reviewed in this analysis. Eleven articles were excluded because their definitions, titles and abstracts were unclear to the concept under analysis in this article. Forty three articles were therefore selected and cited in this article as they presented clear explanation of the concept under analysis.

## RESULTS

Fifty four published articles were identified and reviewed and 43 of them were cited in this analysis. The 11 excluded articles were considered as unclear, irrelevant and unnecessary for this analysis. Some articles that defined asymptomatic bacteriuria differently were excluded in this article. All the 43 articles from which information was obtained were approved for publication after ethical review.

Definitions of asymptomatic bacteriuria were isolated and cited in this analysis from The MacGraw- Hill Concise Dictionary, Merriam Webster and Medical Dictionary. Published articles on Google Search, Google Scholar and Pubmed including Saquib, Saquib and Ionnidis (2002), Ruben et al., (1992), Imade et al., (2010), Frayne, (2011), Platt, 1983 and Muharram et al., (2012) were useful in providing clear definitions of asymptomatic bacteriuria. Deductive analysis was used to identify and list defining attributes of asymptomatic bacteriuria.

Theoretical perspective of asymptomatic bacteriuria was described using published articles including Manjula et al., (2016), Smail, (2007), Stein and Funfstuck (2000) and Ozyurek and Usta, (2013). Antecedents and consequences of asymptomatic bacteriuria were identified and described which enhanced an understanding of asymptomatic bacteriuria and implication especially to nursing. Cases including model, borderline, related, contrary and illegitimate were presented here to increase understanding of the concept. Empirical referents were also listed which help with tooldevelopment for measurement of concept especially in research.

### Definitions of Asymptomatic bacteriuria

Asymptomatic means literally the absence of symptoms or showing no symptoms of condition (Saquib et al., 2002). It describes a condition that is present but in which a person does not show any signs or symptoms of disease (McGraw- Hill Concise Dictionary). The American Heritage Dictionary of the English language defines bacteriuria as presence of bacteria in urine at a level indicating infection without symptoms.

Bacteriuria is also defined in the Merriam Webster and the Medical Dictionaries as the presence of bacteria in urine, bacteriuria, which is diagnosed when there is a significant number of bacteria showing up in a properly obtained urine sample. The American Heritage Dictionary of the English Language and the Merriam Webster dictionaries asymptomatic bacteriuria is defined as the presence of bacteria in a non- contaminated urine specimen without signs and symptoms of urinary tract infection. The Medical Encyclopaedia defines asymptomatic bacteriuria as the occurrence of bacteria in the urine without causing symptoms.

Asymptomatic bacteriuria is also known as asymptomatic urinary infection is defined isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from a person without symptoms or signs referable to urinary infection (Ruben et al., 1992). Asymptomatic bacteriuria is therefore the isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from a person without symptoms or signs referable to urinary infection (Nicolle et al, 2005).Asymptomatic bacteriuria is diagnosed when a specified quantitative count of bacteria in an appropriately collected urine specimen isolated (Bryan, 2015).Asymptomatic bacteriuria was defined as the presence of bacteria in a voided urine sample following bacterial colonisation of the urinary tract which does not cause symptoms (Marchiano, 2012).

Asymptomatic bacteriuria was defined as the presence of bacteria above 100 000 colony forming units per millilitre in urine of an individual without signs or symptoms of urinary tract infection (Krasner, 2015). Asymptomatic bacteriuria is present if in one, two or more occasions of more than 100 000 colony forming units per millilitre are found in aseptically collected midstream urine, given that the same microorganism is isolated (Stein and Funfstuck. The Department of Health team (2013) defines asymptomatic bacteriuria as the persistent bacterial colonisation of the urinary tract without symptoms common in pregnancy. This definition is in line with another which stated that asymptomatic bacteriuria is the persistent bacterial colonisation of the urinary tract without urinary symptoms, defined by 100 000 colony forming units of a single organism (Frayne, 2011).

Asymptomatic bacteriuria was noted to be a condition in which a urine culture reveals a significant growth of pathogens that is greater than  $10^5$  bacteria per millilitre but without the patient showing symptoms of urinary tract infection (Imade et al, 2010).In asymptomatic bacteriuria a large number of bacteria are present in urine but the person has no symptoms (Platt, 1983).

Asymptomatic bacteriuria was reported to be a major risk factor for development of a urinary tract infection during pregnancy which results in serious medical and obstetrical complications if untreated (Prasanna et al., 2015).In a different source it was stated that asymptomatic bacteriuria describes a condition in which urine culture reveals a significant growth of pathogenic bacteria, especially greater than 100 000 of colony forming units per millilitre of urine (Muharram et al., 2014).The presence of a significant quantity of bacteria in a urine specimen properly collected from

a person without symptoms or signs of urinary tract infection characterises asymptomatic bacteriuria (Colgan et al., 2006).

### **Theoretical perspectives of asymptomatic bacteriuria in pregnancy**

The urinary tract is the system including the kidneys, ureters, bladder and urethra. Pregnancy causes numerous changes in the woman's body. These changes together with an already short urethra (3- 4 centimetres) and the challenge with hygiene due to a distended pregnant body increases the frequency of urinary tract infection in pregnant women (Manjula et al., 2016). According to The Health line (2012) the bacteria may be introduced in the urinary tract during intercourse, and when wiping after a bowel movement.

The changes are due to effects of increased levels of progesterone and relaxin, and the mass effect of the growing uterus which obstruct the ureter at the level of the pelvic inlet, impaired bladder emptying, enlarged kidneys and increased glomerular filtration rate by 30 to 50% (Stein and Funfstuck, 2000). These changes lead to dilation of ureters and renal pelvis, displacement of the urinary bladder from pelvis into the abdomen (Smail, 2007). Loss of bladder and ureter tone promote urine stasis (Ozyurek and Usta, 2013).

Specific virulence determinants in uro-pathogenic strains of *Escherichia Coli* including toxins and adhesins, pili or fimbriae that allow adherence to uro- epithelial cells (Smail, 2007). This prevents bacteria from urinary lavage allowing for multiplication and tissue invasion are associated with invasive infection and pyelonephritis (Smail, 2007). In pregnancy asymptomatic bacteriuria often progresses to pyelonephritis (Krasner, 2015). This progression occurs due to biological, physiological and hormonal changes that occur in pregnancy (Manjula et al, 2016). Adherence is one single marker most frequently associated with progression to pyelonephritis (Smail, 2007). The risk of getting asymptomatic bacteriuria is increased by a history of low socio- economic status and diabetics in pregnancy (Yeshitela et al., 2012). In nursing practice screening for asymptomatic bacteriuria need to be considered as an interdisciplinary strategy to early detection and treatment of the condition.

### **Determining Defining attributes**

This section involves taking notes on characteristics of the concept under study that appear over and over again. These characteristics become the defining attributes on the concept being analysed. The cluster of these attributes are the most frequently associated with the concept. This process will allow the broadest insight into the concept. It therefore involves listing the defining attributes of the concept.

In this analysis the defining attributes for asymptomatic bacteriuria in pregnancy include the following:

- (a) A pregnant woman is without typical symptoms for urinary tract infection.
- (b) Clean catch midstream urine sample is provided by the pregnant woman for testing for asymptomatic bacteriuria.
- (c) Urine culture test is done to detect asymptomatic bacteriuria during pregnancy.
- (d) Significant growth of a single pathogenic bacteria to levels above 100 000 colony forming units per millilitre occur.
- (e) Pathogenic bacteria may be identified in urine on one, two or more occasions.

#### **(a) Patient is without typical symptoms for urinary tract infection**

The term asymptomatic is used when a condition is present, but a person does not yet have any symptoms (Eldridge, 2016). Asymptomatic means without symptoms, where symptoms are the changes that you notice in your body that causes one to seek medical care (Andrea, 2016). When bacteriuria is asymptomatic, it means that bacteria may be present in urine without showing any sign or symptoms of the condition (Fong et al., 2013). Symptoms of urinary tract infection often include increased frequency, urgency, dysuria, haematuria and pyuria (Frayne, 2011). These symptoms are absent when the pregnant woman has asymptomatic bacteriuria. Asymptomatic bacteriuria therefore means the presence of significant bacteriuria without symptoms on an acute urinary tract infection Fong et al, 2013).

#### **(b) Midstream urine sample provided by the pregnant woman is tested for asymptomatic bacteriuria**

The quantitative definition enables differentiating between contamination in a voided urine and a true urinary infection (Hinmann, 1963). Significant bacteriuria at  $10^5$  is very useful as it signifies either true bacteriuria or contamination in a voided urine specimen (Hinmann, 1963). The quantitative definition of bacteriuria will therefore distinguish bacterial colonisation of the urinary tract from contamination, where density of bacteria infected urine is usually several magnitude higher than the density of bacteria in contaminated urine (Rowe and Juthan- Mehta, 2013). Asymptomatic bacteriuria therefore refers to detection of bacteria in a properly collected sterile urine sample (Healthline, 2012). A single clean catch voided urine specimen with one bacterial species isolated in a quantitative

count of  $10^5$  colony forming units per millilitre identifies bacteriuria in asymptomatic pregnant women (Nicolle et al., 2005).

### **(c) Urine culture is reliable as a screening test for asymptomatic bacteriuria during pregnancy**

The gold standard and definitive diagnostic test is the urine culture test. This is the most reliable and appropriate screening test used for asymptomatic bacteriuria (U.S Preventive Services Task Force, 2014). There is no available test that has enough sensitivity and negative predictive value that is comparable to the urine culture test as a screening test for ASB especially for a large population of the pregnant women (Manjula et al., 2016). Several screening tests of clean catch urine have been identified including urine culture, urinalysis and urine dipstick, urine oxid, urine microscopy and the Griess nitrite tests. However the other tests like urine microscopy and the Griess nitrite test are useful as screening tests.

Asymptomatic bacteriuria diagnosis is therefore confirmed when a urine culture detects a significant growth of bacteria greater than  $10^5$  bacteria per millilitre but without symptoms of urinary tract infection (Manjula et al., 2016).

### **(d) There is significant growth of a single pathogenic bacteria to levels above 100 000 colony forming units per millilitre**

Quantitatively bacteriuria is defined as presence of more than 100 000 ( $10^5$ ) pathogenic bacteria per millilitre of urine (Eldridge, 2016). This is often considered as significant and diagnostic of urinary tract infection. The term significant bacteriuria is used to refer to a true urinary tract infection (Hinmann, 1963). Bacteriuria was defined as the culture positivity for the same micro-organism for at least twice as more than 100 000 colony forming units (Ozyurek and Usta, 2013). For a pregnant woman a single culture positive of more than 100 000 colony forming units is treated as significant bacteriuria (Ozyurek and Usta, 2013).

The most commonly isolated (80%) uropathogen is *Escherichia Coli* (Rowe and Juthan- Mehta, 2013). The other pathogens include enterobacteriae, *Klebsiella*, *Enterobacter* and *Proteus*, *staphylococcus saprophyticus*, *staphylococcus Aureus*, *enterococcus Faecalis* and group B streptococcus (Ozyurek and Usta, 2013).

### **(e) Pathogenic bacteria may be identified in urine on one, two or more occasions.**

Pregnant women often have recurrence of asymptomatic bacteriuria (Ozyurek and Usta, 2013). An estimate 20% to 30% of this infection in pregnancy are recurrences (Matulay et al., 2016). Recurrence of asymptomatic bacteriuria often result in an increase in its prevalence.

### **A model case**

A model case is a real life example of the use of the concept that includes all the defining attributes of the concept (Walker and Avant, 2005). A model case for asymptomatic bacteriuria will be described here. A 31 year old pregnant woman reported at an antenatal clinic at gestation 12 weeks for her initial registration. The current pregnancy was her fourth. She has a history of one previous stillbirth and one preterm delivery. The woman denied a history of any previous illness, high temperature, back pain, or any micturition disorders. She did not report of any lung problems or any heart complaints.

On examination, Blood pressure was 130/70 and the heart rate was at 84 beats per minute. Respirations were at 16 breaths per minute. Foetal heart beat was not audible. Her last menstrual period was noted. Gestation of 12 weeks was calculated using the date given as first day of the last menstrual period. Her external genitalia was normal with an uninflamed urethra and no offensive odour. No vaginal bleeding was noted. Pelvic measurements were normal.

The woman was instructed to add and provide midstream clean catch urine in a sterile bottle for urine culture test for screening for asymptomatic bacteriuria. The urine was sent to the medical laboratory for microscopy, culture and sensitivity test. Results which were obtained on day three after submission of urine sample revealed significant *Escherichia coli* which was susceptible to gentamycin, nitrofurantoin, cefuroxime, ceftriaxone, amoxicillin and ciprofloxacin. The pathogen was resistant to ampicillin, and cefazolin. The woman was commenced on nitrofurantoin to take for 7 days. The woman was reporting at the antenatal clinic every four weeks for routine antenatal care services including monitoring blood pressure, weight, foetal heart- beat, and fundal height. The woman did not present at any of the visits with bacteriuria symptoms.

At gestation 32 weeks by dates the woman was admitted at the clinic with premature rupture of membranes. She complained of a backache and frequency of micturition. On examination, foetal heart was heard at 130 beats per minute. The cervix was smooth and 4 centimetres dilated, blood pressure was 130/70mmHg and height of fundus was at 30 weeks on palpation. There was no bleeding noted. Baby was in cephalic presentation. The woman later delivered a preterm baby a day after admission. The baby weighed 1 600 grams and had an Apgar score of 7-8 out of 10. The baby was admitted in a neonatal intensive care unit.

Four weeks after delivery the woman reported at a family care clinic with dyspnoea, fever and fatigue. Urine culture test yielded significant E coli growth. Blood pressure was 140/70, pulse 110 beats per minute and temperature was 39.6°C. The woman had full blood count done and results revealed elevated white cell count. The haemoglobin level was 11.2micrograms per decilitre. Antibio gram results revealed that the uro-pathogen was sensitive to cefuroxime, ceftriaxone and gentamycin. The pathogen was noted to be resistant to ampicillin and ceftazidime.

### Analysis

For this case the woman was screened for asymptomatic bacteriuria at gestation 12 weeks as recommended. She was asymptomatic for bacteriuria but a urine culture done yielded significant E Coli. The woman was treated with an antibiotic amoxicillin. The assumption is that she took all her medication for the seven days. There was no other test for asymptomatic bacteriuria until at gestation 32 weeks when she had a preterm birth. It could be that there was recurrence of the pathogen which was not identified

### Borderline Case

A borderline case contains some of the defining attributes but not all of them (Walker and Avant, 2005). A borderline case will be presented here. A 25 year old woman at gestation 34weeks was admitted with a history of foul smelling vaginal discharge, lower abdominal pain, backache and vomiting. There was no history of typical urinary tract symptoms. The woman was not registered for antenatal care. On examination vaginal discharge was foul smelling with thick yellowish discharge. Pelvic measurement was normal. Head of foetus was freely movable in a cephalic presentation. Blood pressure was at 140/80mmHg, respirations at 22 breaths per minute and temperature at 38°C. Blood count was done and white cell count was elevated. Haemoglobin was at 10.2mg/dl Mid-stream clean catch urine was tested and results revealed that there was enterococcus faecalis in the urine. Blood test for Rapid plasma reagin was positive. This was noted to be sensitive to ceftriaxone, amoxicillin and gentamycin. The woman had a sexually transmitted infection and contaminated urine asymptomatic bacteriuria.

At 36 weeks the woman delivered. The baby weighed 2200 grams. The Apgar score for the baby was 8/10. The baby was admitted in the Neonatal intensive care unit for observation and care.

### Analysis

In this analysis the woman was asymptomatic for bacteriuria. When a urine test was done an insignificant yield of a pathogen was obtained. This may have been transferred as a concomitant into the urine bottle during collection.

### Related Case

This is a case related to the concept a bit but does not contain the critical or defining attributes (Walker and Avant, 2005). A 32 year old woman reported at an antenatal clinic for initial registration of pregnancy at 20 weeks gestation by dates. The woman did not have any urinary tract symptoms. She however reported of some running nose and cough. On examination the blood pressure was 130/80, respirations at 18 breaths per minute and pulse 88 beats per minute and fundal height was at 22 by palpation.

Her urine was tested by urinalysis test which identified protein plus but no trace for glucose. A urine culture that was done did not identify any urinary pathogen. The woman had blood tests done which showed a slightly elevated white cell count and haemoglobin of 12.4mg/dl. The woman administered paracetamol for the cough and flue. Six weeks later the woman got admitted with backache and nausea. At 24 weeks the woman came for routine antenatal care. No typical urinary tract symptoms were reported. At 28 weeks the woman was admitted with a history of vomiting and premature rupture of membranes. Her cervix was 6cm dilated. The woman delivered a preterm baby weighing 1200 grams.

At week seven weeks post- delivery the woman was admitted with fever, difficulty in breathing, increased frequency and nausea. Blood tests revealed sepsis and urine culture tests did not identify any urinary tract pathogen. The woman was commenced on intravenous antibiotics for 3 days.

### Analysis

The woman did not present with urinary tract symptoms initially. Both urine culture tests never revealed any pathogen in urinary tract. When she came back on post-delivery check, she presented with symptoms of bacteriuria. It might be that the bacteria were in the urinary tract though present in insignificant amount to be detected by culture

test. The symptoms she presented with post- delivery are typical of complications of untreated asymptomatic bacteriuria.

### **Contrary case**

This means that the case is not at all related to the concept being analysed (Walker and Avant, 2005). A 28 year old pregnant woman at 12 weeks gestation was admitted with a history of fever, backache, and abdominal pain and loose stool blood. She also complained of nausea and vomiting.

On examination Blood pressure was 140/80mmHg, temperature 38.2<sup>o</sup>C and pulse 100 breaths per minute. Blood count was done as well as urine sent for culture and stool specimen collected for micro culture and sensitivity. Results revealed that Shigella spp was isolated in the stool. No bacteria was identified in urine sample. Urine culture test was done but no pathogen was identified.

The woman was admitted and commenced on antibiotics. She was discharged to go home on day three. The woman later delivered at 39 weeks a baby that weighed 3200 grams.

### **Analysis**

This is a case of a pregnant woman who had an intestinal infection with Shigella. There was no urinary tract infection as there was no pathogen isolated from the urinary tract.

### **Invented case**

This is a constructed case, not existing in the real world (Walker and Avant, 2005). A 23 year old pregnant woman went to register her pregnancy at 6 weeks gestation. The woman did not have any complaints. At registration the woman had a scan of the pelvis and it showed she had an asymptomatic bacteriuria. The woman was commenced on antibiotic ciprofloxacin for 14 days. No urine tests were done and blood tests only done to determine the haemoglobin level.

A pelvic scan was done at 26 weeks which identified pathogenic bacteria in urinary tract. Woman was diagnosed with asymptomatic bacteriuria for the second time. At 38 weeks the woman was admitted with premature rupture of membranes and later delivered a baby who weighed 1200 grams.

### **Analysis**

This case presents a woman diagnosed with asymptomatic bacteriuria at 6 weeks gestation after a scan was done. A scan cannot diagnose asymptomatic bacteriuria.

### **Illegitimate case**

This is a case in which the concept is improperly used (Walker and Avant, 2005). At 16 weeks gestation a 25 year old woman presented at an antenatal care clinic for her initial registration. The woman did not have any problems. On examination she had a blood pressure of 120/70mmHg, respirations at 16 breaths per minute and pulse at 78 beats per minute. Foetal presentation was bulky situated below umbilicus. No vaginal bleeding was noted.

Urine was collected for screening with the micro culture test and blood count was also done. Results from the urine culture test revealed that there was significant Escherichia coli in urine and woman was diagnosed asymptomatic bacteriuria.

The woman was referred to the doctor who together with the woman planned an abortion because this was a complicated pregnancy which endangered life of mother and foetus. The woman had an abortion.

### **Analysis**

Asymptomatic bacteriuria is a complicated urinary tract infection but this is not indication for abortion. Illegally asymptomatic was used to plan an abortion.

### **Antecedents**

Antecedents are defined as events occurring prior to the concept (Walker and Avant, 2005). Asymptomatic bacteriuria occurs in both non- pregnant and pregnant women but in this analysis the concept will be analysed in

relation with its occurrence in pregnancy. the woman has to be pregnant, and often present with history of risk factors including poor hygienic practices, no washing post coital, wiping from back to front after toilet use, poor hand washing. Other risk factors that may be existing include history of recurrent urinary tract infections, diabetes mellitus, and immune compromised.

Pregnant women are at a higher risk of contracting the infection due to physiologic and metabolic changes that occur. Hormonal, metabolic and mechanical factors that provide favourable conditions for microbial growth in the urine facilitate a great incidence of asymptomatic bacteriuria in pregnant women (Garnizov, 2016). When a woman gets pregnant significant alterations occur in the urinary tract. These changes have a huge impact on acquisition and the natural history of bacteriuria (Prasanna et al, 2015). The changes in urine composition include the high levels of glucose, amino acids and other nutrients (Garnizov, 2016).

The significant changes that occur in the urinary tract include dilatation and decrease in peristalsis in ureters and decrease in bladder tone (Prasanna et al, 2015). The relaxation of vesicoureteral junction will cause urine retention in the bladder and reflux of urine from bladder back up the ureters and to renal pelvis ((Garnizov, 2016). During pregnancy bladder volume increases and detrusor tone decreases (Prasanna et al, 2015). Pressure which will be coming from the expanding uterus further aggravates dilation of the ureters (Perera et al., 2012). These changes will therefore facilitate bacterial colonisation and ascending infection (Perera et al, 2012).

## Consequences

Consequences are defined as events occurring as a result of the concept (Walker and Avant, 2005). Up to 40% of pregnant women with asymptomatic bacteriuria will develop an acute kidney infection such as pyelonephritis (Smail and Vazquez, 2007). Approximately 50% of these will have premature labour (Siakwa et al, 2014). Untreated asymptomatic bacteriuria in pregnancy often will lead to adverse maternal and foetal outcomes (Kehinde et al., 2011).

Adverse maternal outcomes that may occur include symptomatic cystitis, pyelonephritis and preterm labour and delivery (Prasanna et al, 2015). In pregnancy pyelonephritis may lead to septicaemia, chronic pyelonephritis, loss of renal function and respiratory distress syndrome (Bryan, 2015). Prematurity, low birth weight and perinatal mortality are possible adverse foetal outcomes (Perera et al., 2012).

In pregnant women asymptomatic bacterial infection can progress upward causing acute urethritis, acute cystitis and acute pyelonephritis (Kehinde et al., 2011). Pyelonephritis in turn often lead to adverse outcomes such as preterm birth labour which leads to preterm birth. The most common complication (13. 3%) reported in women with asymptomatic bacteriuria is high incidence of preterm labour (Garnizov, 2016). Highly reported also are incidences of preterm amniotic sac rupture, polyhydramnios and high incidence of pregnancy loss (Garnizov, 2016).

Asymptomatic bacteriuria in pregnancy could be risk factor for occurrence of prenatal and postnatal pyelonephritis which can also lead to life threatening conditions like uro-sepsis and adult respiratory distress syndrome (Garnizov, 2016). Antepartum pyelonephritis is associated with adverse perinatal outcomes specifically preterm birth (Garnizov, 2016).

## Defining empirical referents

The last step of concept analysis is defining empirical referents (Walker and Avant, 2005). Empirical referents are categories of actual phenomena that by their existence or presence demonstrated the occurrence of the concept. Empirical referents are measurable ways to demonstrate occurrence of a concept. These contribute to construct and content validity. For asymptomatic bacteriuria the empirical referents available include testing of midstream clean catch urine sample provided by a pregnant woman using the urine culture test. This is the gold standard test as the gold standard test. Other screening tests like dipstick, urine microscopy and Griess nitrite test are alternatives but none of them is as reliable as the culture test is.

## Implications for nursing Practice

An understanding of asymptomatic bacteriuria in pregnancy through this analysis is expected to improve clinical practise in nursing by improving assessment and diagnoses of the condition. Knowledge and understanding of asymptomatic bacteriuria will encourage nurse educators to review their curriculum for nurses and midwives so that relevant issues are incorporated in nursing theory for practice. More research in relation to asymptomatic bacteriuria will be stimulated through the analysis of the concept. Through this analysis nurses and midwives will be expected to provide more comprehensive care during antenatal care of pregnant women with the aim to prevent all preventable neonatal deaths especially those that are related to preventable preterm birth. Analysis of this concept will enhance



understanding of its meaning and its theoretical and practical implications for nursing.

## Conclusion

Walker and Avant's method of concept analysis was used to provide an analysis of asymptomatic bacteriuria in pregnancy. Definitions from several sources were identified and presented which helped to identify defining characteristics of asymptomatic bacteriuria in pregnancy. The defining attributes were listed and explained to provide clear meaning and increase understanding of the concept. Antecedents and consequences of asymptomatic bacteriuria in pregnancy were also outlined. Many articles that presented on asymptomatic bacteriuria reported that asymptomatic bacteriuria is common in pregnancy and that it is associated with preterm birth.

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