

THE RISK OF WOMEN IN MANITOBA ACQUIRING  
PELVIC INFLAMMATORY DISEASE  
FROM ONE OR MORE EPISODES OF GENITAL *CHLAMYDIA TRACHOMATIS*  
OR *NEISSERIA GONORRHOEAE* INFECTIONS

BY

DAWN L. WUSKYNKYK

A Thesis  
Submitted to the Faculty of Graduate Studies  
in Partial Fulfillment of the Requirements of the Degree of

MASTER OF NURSING

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**THE UNIVERSITY OF MANITOBA**  
**FACULTY OF GRADUATE STUDIES**  
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## Abstract

The association between being infected with the sexually transmitted infections (STIs), *Chlamydia trachomatis* or *Neisseria gonorrhoeae* and developing pelvic inflammatory disease (PID) is supported in the literature. Research also demonstrates an association between repeat infections with chlamydia or gonorrhea and acquiring PID. While there is some information from Canada on this topic, the majority of the research is from the United States and abroad. Additionally, there are few studies that have been able to examine the risk of acquiring PID utilizing a prospective study design.

The purpose of this study is to identify the risk of women in Manitoba acquiring PID from one or more episodes of genital chlamydia or gonorrhea. The length of time following a genital chlamydial or gonococcal infection where PID develops is explored. Obtaining information on the risks of acquiring PID, among women in Manitoba with genital chlamydia or gonorrhea, has important policy implications such as early detection and screening of STIs, treatment procedures, partner notification and contact tracing.

A surveillance system framework was used to guide the study. The data were acquired by linking administrative databases from Cadham Provincial Laboratory and Manitoba Health. Three cohorts of women were chosen, based on their history of testing positive or negative for STIs. Quantitative data analysis was completed through the use of the Statistical Analysis Software (SAS) program. Descriptive statistics and frequency distributions were completed for each variable to become familiar with the data. Since this is a cohort study, incidence rates and measures of association, such as the relative risk, were completed. Tests of statistical significance were also calculated. Study findings indicate that 15 – 24 year old women, in Manitoba with documented infections of genital

*Chlamydia trachomatis* or *Neisseria gonorrhoeae* are at risk of acquiring PID. Compared to women infected with genital chlamydia, women infected with genital gonorrhea had a higher percentage of previous diagnosis of PID and experienced higher rates of hospitalization and outpatients visits related to PID. Recommendations related to practice and further research are made. Existing policies and future policies on testing and treatment of STIs within Manitoba will be more relevant by understanding the sequelae of chlamydia and gonorrhea.

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## Dedication

*To my parents, Marlene and Robert Wuskynyk  
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confidence to pursue my academic aspirations*

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## Chapter One: Introduction

Sexually transmitted infections (STIs) have important implications for women. They are more easily transmitted to women than to men, infections in women are less likely to be symptomatic, are more difficult to diagnosis, and are more likely to cause serious long-term sequelae. If STIs are left untreated, they may lead to pelvic inflammatory disease (PID), ectopic pregnancy and infertility (Althaus, 1991; Egger, Low, Smith, Lindblom, & Herrmann, 1998). For the purpose of this project the focus will be on the association between STIs and PID. Additionally, of the studies reviewed on this topic, very few have been able to examine the risk of women acquiring PID utilizing a prospective study design.

The link between nursing, epidemiology and public health has played an important role in the management of communicable diseases, such as STIs. Nurses and other health care professionals are mandated by the *Public Health Act* to report communicable diseases, such as chlamydia and gonorrhea to provincial and federal health authorities (Public Health Act, 2003). Local health authorities have a responsibility to monitor, investigate disease outbreaks and participate in disease related research. Nurses support these responsibilities through the case management and eradication of STIs. Using the nursing process and epidemiological methods, primary, secondary and tertiary prevention interventions are implemented in order to decrease STIs (Malloy & Yiu, 2005).

Chapter One will introduce the problem under investigation, variable definitions and the proposed research questions. Assumptions around the research findings will be made and the relationship of this study to nursing will be discussed.

### *Statement of the Problem*

The total population in Manitoba is approximately 1.1 million. Of this population, there are about 600 laboratory-confirmed cases of *Neisseria gonorrhoeae* and about 3000 laboratory-confirmed cases of *Chlamydia trachomatis* infection reported yearly. About three-quarters of the reported chlamydial infections occur in women and those between the ages 15 and 24 years are at greatest risk (Beaudion & Blanchard, 1996).

Untreated bacterial STIs, such as chlamydia and gonorrhea can cause serious complications, such as PID (Egger et al., 1998; Noble, 1990; Schachter, 1989). In Manitoba the hospitalization rate for PID in 1996 was 94.2 per 100,000 (Beaudoin & Blanchard, 1996). An estimated \$1.5 billion per year is spent on STIs related to direct and indirect costs (Schachter, 1989).

High-risk factors associated with chlamydial and gonococcal genital infections include young women, less than 20 years of age, single, inner city, low socioeconomic status, and multiple sex partners (Cates & Wasserheit, 1991; Graham & Blanco, 1990; Hillis, 1994). As a result of this, younger women (< 20 years old age) have twice the number of episodes of PID in comparison to older women (Graham & Blanco, 1990). Burst (1998) states that adolescents account for approximately 16 – 20% of the 1 million cases of PID reported each year. Faro (1991) further supports this by stating that approximately 20 – 40% of all sexually active women have been exposed to *Chlamydia trachomatis* and have positive antibodies to this organism.

Chlamydia is transmitted from person-to-person with particular ease through sexual intercourse, because approximately 70% of cases are asymptomatic and the patient is unaware of the infection, goes untreated, and continues to participate in unprotected

sex with their partner(s), continues to transmit the infection to one another, therefore increasing the risk of transmission of STIs. Early identification of the signs and symptoms of *Chlamydia trachomatis* and *Neisseria gonorrhoeae* and early treatment of these STIs will reduce the duration of the infection and therefore the associated sequelae (Chinn, 2000; Graham & Blanco, 1990; Hillis & Wasserheit, 1996).

Most chlamydial infections are more common in women (Eng & Butler, 1992; Hillis, 1994) and women tend to be at greatest risk for chlamydial sequelae because their reproductive potential is at risk (Graham & Blanco, 1990). If chlamydia or gonorrhea is left untreated, the infection can further spread into the internal genital organs and cause PID. Since chlamydia, gonorrhea and PID can be asymptomatic, the infection can go untreated for a long time and cause tubal scarring, which can lead to infertility, partially blocked fallopian tubes or an ectopic pregnancy (Brunham et al., 1988).

Hillis and Wasserheit (1996) state that approximately 85% of women with PID delay seeking care and women with chlamydia are more likely to do so because their symptoms are minimal or absent. Women with gonorrhea or chlamydia associated PID who delayed care for three or more days were 2.6 times as likely to develop impaired fertility as those who sought care promptly (95% confidence interval 1.2, 5.9). Approximately 20% of women who delayed care suffered later infertility, compared with 8.3% who sought care promptly (Hillis et al., 1993).

Similarly, early detection of PID is important to prevent sequelae associated with PID, however, a clinical diagnosis of PID remains difficult due to the fact that the majority of cases are asymptomatic and even among experienced clinicians symptoms are correctly attributed to PID in only 65% of all cases (Temmerman, 1994).

Currently, there is little information on the incidence of PID acquired from *Chlamydia trachomatis* and *Neisseria gonorrhoeae* among women in Manitoba. Locally, Manitoba has the highest rate of chlamydia and gonorrhea infections among women of all provinces in Canada. The number of chlamydia cases in Manitoba for the 2003 calendar year increased by 9.23% compared to 2002. For gonorrhea there was a 42.4% increase in the number of cases in 2003, compared to 2002 (Manitoba Health, 2003). The rationale for this increase in STIs is difficult to ascertain and the extent to which, more complete reporting of STIs that occur in Manitoba, compared to other provinces is unknown. If chlamydia and gonorrhea infections are left undiagnosed and untreated complications include, infertility, ectopic pregnancy and PID (Burst, 1998).

Cates and Wasserheit (1991) further support this by stating that numerous seroepidemiological studies have confirmed the association between past infection with chlamydia and PID. While the rates of chlamydia and gonorrhea in Manitoba are known, the actual sequelae and number of PID cases associated with chlamydia and gonorrhea are unknown. The lack of this information makes policy formulation difficult. By demonstrating a more accurate account of sequelae associated with STIs in Manitoba women, the need for primary interventions with respect to STIs may be substantially supported. Failure to control these infections and decrease the number of cases of chlamydia and/or gonorrhea can have serious implications on the health of Manitoba women as well as the health care system. Brunham et al. (1988) state that the majority of PID cases are theoretically preventable by early recognition and treatment of uncomplicated cervical infections of chlamydia and gonorrhea (Burst, 1998; Chaudhry, Goel, Dhawan, & Aggarwal, 1997). The delay in treating STIs or PID can also lead to the

need for hospitalization, which is a huge financial burden on the health care system. Orr et al. (1994) state that in Manitoba in 1990, the hospitalization rate for PID was 71 per 100,000, while the outpatient physician visit rate was 463 per 100,000. Todd, Estany, and McLaren (1988) further state that in Canada in the mid 1980s, the total direct and indirect cost associated with PID, involuntary fertility and ectopic pregnancy was estimated to be over \$140 million per year. Thus the financial burden of STIs and PID is evident.

To prevent the sequelae of STIs, one must first look at the reducing the number of STI cases. Cates and Wasserheit (1991) and Aral and Wasserheit (1998) state that early identification of individuals infected with STIs, through widespread screening programs, and compliance with curative treatment procedures are effective in decreasing STIs. Magnusson et al. (1986) further support this and state that aggressive contact tracing and partner notification combined with the appropriate, current screening procedures would be effective in decreasing the incidence of STIs and therefore the incidence of PID.

As a Public Health Nurse and a former member of the Communicable Disease Control (CDC) Unit at Manitoba Health, the research questions associated with this topic were created based on my personal interest in this topic and the expectations set out by the CDC Unit. In Canada, provincial authorities have the responsibility to report the occurrence of communicable diseases, such as STIs to the Centre of Infection Disease Prevention and Control in Ottawa (Malloy & Yiu, 2005). Regional health authorities also have a responsibility to report communicable diseases to the CDC Unit at the provincial level, thus aiding in the case management of communicable disease control (Malloy & Yiu, 2005). The role of the Public Health Nurse (PHN) in the management of STIs is

significant. The work of the PHN involves breaking the chain of infection related to STIS through partner notification, education and screening for STIs (Malloy & Yiu, 2005).

### *Definitions*

*Pelvic Inflammatory Disease (PID)*: Inflammatory condition of the female pelvic organs, caused by bacterial infections. Most common bacterial infections are chlamydia and/or gonorrhea (Glanze, 1986).

*Chlamydia trachomatis*: Sexually transmitted bacterial genital infection. Symptoms include mucopurulent discharge, burning on urination, itching. Most individuals are asymptomatic. Mode of transmission: sexual intercourse with an infected individual. Incubation period: poorly defined, approximately 7-14 days or longer (Chinn, 2000).

*Neisseria gonorrhoeae*: Sexually transmitted bacterial genital infection. Symptoms include purulent discharge, burning on urination, itching. Most individuals are asymptomatic. Mode of transmission: sexual intercourse with an infected individual. Incubation period: usually 2-7 days, sometimes longer with symptoms (Chinn, 2000).

*Women in Manitoba*: All women, 15 years and older who resided in Manitoba between 1984 and 2000. The women consisted of those who tested positive or negative for chlamydia and/or gonorrhea and also had a positive diagnosis of PID. Women, who had never been tested for Chlamydia or gonorrhea but had a positive diagnosis of PID, are also included. Women who were deceased or had cancelled their provincial health insurance coverage were excluded.

### *Research Questions*

1. What is the risk of PID among women in Manitoba with previous documented episodes of chlamydial and gonococcal genital infections? What is the risk of acquiring PID: If tested negative for chlamydia or gonorrhoea? If never been tested for chlamydia or gonorrhoea?
2. What is the proportion of women diagnosed with chlamydia and gonorrhoea who had a previous diagnosis of PID?
3. What is the survival time in months between the initial diagnosis of chlamydia and the initial diagnosis of PID? What is the survival time, in months between the initial diagnosis of gonorrhoea and the initial diagnosis of PID?
4. What is the rate of hospitalization for PID among women who have chlamydia, gonorrhoea or neither? What is the rate of outpatient visits for PID among women who have chlamydia, gonorrhoea or neither?
5. What is the geographic distribution of chlamydia and gonorrhoea? Are some municipalities more susceptible to these infections? What characteristics within a community effect the rates of chlamydia and gonorrhoea?

### *Assumptions*

It is expected that the incidence of chlamydia and gonorrhoea will be higher in the 15 – 25 year age group and that this age group will be at a higher risk of acquiring PID compared to other age groups. Since the majority of PID cases are asymptomatic and many go untreated as a diagnosis of PID is difficult, it is assumed that women from the 15 – 25 age category who are expected to be infected with an STI, will also be at a

greater risk of being infected with PID, 10 – 15 years later, putting them at 30 – 35 years of age.

Women in Manitoba with one or more documented episodes of chlamydial and/or gonococcal genital infections will also be at a greater risk of acquiring PID compared to women who have never been infected with an STI. It is also expected that the rate of hospitalization for PID will be low in comparison to the number of chlamydia and gonorrhea cases as the majority of PID cases are asymptomatic, difficult to diagnose and the cases are expected to primarily be seen at the physicians' office on an outpatient basis.

#### *Relationship of this Study to the Nursing Discipline*

The CDC Unit at Manitoba Health is the provincial authority responsible for reporting communicable disease, such as chlamydia and gonorrhea to the Centre for Infectious Disease Prevention and Control in Ottawa (Malloy & Yiu, 2005). STIs, like chlamydia and gonorrhea, are considered notifiable diseases in Canada under the *Public Health Act* (Public Health Act, 2003). Health care providers are mandated to report all notifiable diseases to the Director of the CDC Unit by the fastest means possible (Public Health Act, 2003). Once these diseases are reported to the director of the CDC Unit, they are entered into a surveillance system to be monitored, analyzed and disease trends identified. This is information important to this research study since the data for this study was provided by Manitoba Health and was initially gathered for surveillance of disease as mandated by the *Public Health Act*. For the purposes of this study, a secondary use of this data was to determine the risk among women in Manitoba in acquiring PID from infections with chlamydia or gonorrhea.

Since Florence Nightingale, nurses have played an important role in epidemiology, disease surveillance, case management and control of communicable diseases (Malloy & Yiu, 2005). As health professionals, nurses are mandated by the *Public Health Act*, Section 43(1), to report STIs and the names of contacts of an STI, or other communicable disease to the Director of the CDC Unit (Public Health Act, 2003). Through the use of epidemiology, the nursing process and research, nurses facilitate disease prevention, case management and the eradication of STIs (Malloy & Yiu, 2005).

### *Summary*

To summarize, there is evidence that if STIs, such as chlamydia and gonorrhoea, are left untreated serious long-term sequelae such as ectopic pregnancy, infertility and PID can evolve. Delay in treating these STIs and their sequelae can have serious implications on the health of women, as well as the health care system. Early identification and treatment of STIs will prevent the associated sequelae. Thus the purpose of this study is to identify the risk of women in Manitoba acquiring PID from one or more genital chlamydial or gonococcal infections.

The chapters that follow provide the following information. Chapter Two provides an overview of the literature on the study topic. The conceptual framework is discussed in Chapter Three. Chapter Four introduces the study methodologies, and Chapter Five is a presentation of the findings. Chapter Six, the final chapter, is a discussion of the findings and includes research and program recommendations, and policy implications.

## Chapter Two: Literature Review

A review of the literature consisted of the available published studies that focused primarily on the sequelae associated with chlamydial and gonococcal infections. The literature identified studies from Canada, United States and abroad. The majority of research on this topic however has been conducted abroad, such as Sweden and in the United States. The following themes were identified: the incidence and sequelae of STIs, the incidence and sequelae of PID, the behavioral and sociodemographic risk factors associated with STIs and PID, the cost associated with STIs and PID, and recommendations that offer preventative and health promotion strategies to deal with the incidence of STIs and therefore PID. An overview of the Manitoba provincial STI program will also be discussed.

### *Incidence and Sequelae of STIs*

The incidence of STIs; chlamydia and gonorrhea are on the rise worldwide. Chlamydia and gonorrhea are the most common STIs and more than 4 million STIs in the United States are caused by chlamydia and gonorrhea (Burst, 1998; Cates & Wasserheit, 1991; Egger et al., 1998; Graham & Blanco, 1990; Mgone, Lupiwa, & Yeka, 2002).

Of the two STIs, chlamydia is the most common and is higher in incidence than gonorrhea. While both chlamydia and gonorrhea have important implications on reproductive health sequelae, particularly in women, chlamydia tends to be the major cause of reproductive morbidity, compared to gonorrhea (Burst, 1998; Cates, 1999; Cates & Wasserheit, 1991; Chaudry et al, 1997; Egger et al, 1998; Faro 1991; Graham & Blanco, 1990; Kamwendo, Forslin, Bodin, & Danielsson, 1996; Magnusson et al., 1986; Mgone et al., 2002).

Stated in the literature is the fact that chlamydia and gonorrhea are common in both men and women and are usually asymptomatic infections. Chlamydia tends to be asymptomatic in both men and women, while gonorrhea is more likely to be asymptomatic in women and symptomatic in men. While these infections affect both men and women, women are at a greater reproductive risk compared to men as these infections are asymptomatic and can go undetected for days, months, or years and can spread from partner to partner causing further spread of infection and further reproductive morbidity. Women with chlamydia who delayed seeking treatment for STIs were six times as likely to be diagnosed with an STI sequelae (Aral & Wasserheit 1998; Champion, Piper, Shain, Perdue, & Newton, 2001; Hillis, 1994; Mgone et al. 2002).

Some of the reproductive health sequelae associated with chlamydia and gonorrhea include chronic pelvic pain, PID, cervical cancer, tubule scarring and infertility (Burst, 1998, Cates, 1999; Cates & Wasserheit, 1991; Chaudhry et al., 1997; Egger et al., 1998; Faro 1991; Graham & Blanco, 1990; Kamwendo et al., 1996; Magnusson et al., 1986; Wang, Burstein, & Cohen, 2002). For the purposes of this study the literature review focused primarily on PID.

#### *Incidence and Sequelae of PID*

In the literature PID is described as a serious reproductive health condition that occurs due to a bacterial infection of the upper female genital tract, which includes the endometrium of the uterus, fallopian tubes and the ovaries (Aral & Wasserheit, 1998). As the incidence of STIs increases, the incidence of PID also increases. The majority of PID cases tend to occur from an infection with either chlamydia or gonorrhea, however a few PID cases have been associated with other causative agents, such as the use of the