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TUBERCULOSIS REAWAKENING – CONSIDERATIONS IN MATERNAL WELFARE

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ABSTRACT

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Tuberculosis is an old new problem. In the beginning of the 20th century TB was responsible for deaths of tens of thousands of Finns. After discovering the medications the situation improved substantially and in the 1970s the prevalence of TB was only 70 new cases per 100 000 inhabitants in Finland. Today the threat of TB is rising: tuberculosis is reawakening due to immigrants from high prevalence countries. These people are from all ages, including fertile women who plan pregnancy or are already pregnant. Measures must be taken to prevent spreading of the disease. These women should get information on the disease, its symptoms and have the Mantoux test done. Midwifes are in an important position in giving the advice and guidance.

This bachelor's thesis was executed as a literature review on tuberculosis particularly on the pulmonary one. Special focus was on gynecology and obstetrics aiming to produce a booklet for midwifes and midwifery students. The booklet was written in English and Finnish. There is a need for more accurate data on the topic. The idea is to update the old information. The booklet is meant to help midwifes recognize and prevent spreading of tuberculosis and further on educate their patients.

The results crystallize in offering an up-to-date package of essential information on TB and its prevention. This information meant especially for midwifes and midwifery students will be useful to other health care professionals as well. This thesis goes beyond the BCG-vaccine; main focus being in detection and prevention of TB.

Keywords: tuberculosis, gynecology, obstetrics, midwifery, maternal welfare

TIIVISTELMÄ

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HÄMÄLÄINEN, EMMI:
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Tuberkuloosi ei ole uusi ongelma. 1900-luvun alussa se oli syynä kymmenien tuhansien suomalaisten kuolemaan. Tuberkuloosilääkkeiden keksimisen jälkeen tilanne parani huomattavasti ja 1970-luvulla tuberkuloosia esiintyi vain noin 70 uutta tapausta 100 000 kansalaista kohti. Taudin uhka on jälleen ajankohtainen: tuberkuloosi on uudelleenheräämässä taudin suurten riskimaiden maahanmuuttajien tullessa Suomeen. Heitä on kaikista ikäluokista, mukaan lukien hedelmällisessä iässä olevat naiset, jotka suunnittelevat raskaaksi tuloa tai ovat jo raskaana. On ryhdyttävä toimenpiteisiin taudin leviämisen ehkäisemiseksi. Näiden maahanmuuttajanaisten tulisi saada tietoa sairaudesta, sen oireista ja heidät tulisi testata Mantoux'n ihokokeella. Kätilöt ovat tärkeässä asemassa antamassa neuvontaa ja ohjausta.

Tämä opinnäytetyö on kirjallisuuskatsaus tuberkuloosista, erityisesti keuhko-tuberkuloosista. Työ keskittyy gynekologiaan ja obstetriikkaan tavoitteena tuottaa myös sekä englannin- että suomenkielinen opaskirjanen. On tarve saada tarkkaa ja tuoretta tietoa tuberkuloosista. Ideana on päivittää vanhat tiedot. Opaskirjasen tarkoituksena on auttaa kätilöitä ja kätilöopiskelijoita tunnistamaan tuberkuloosi ja ehkäistä sen leviäminen.

Opinnäytetyön tuottama päivitetty tietopaketti antaa tärkeää tietoa tuberkuloosista ja sen ehkäisystä. Tämä tietopaketti on tarkoitettu erityisesti kätilöopiskelijoille ja kätilöille, mutta on hyödyllinen muillekin terveyden-huoltoalalla työskenteleville. Opinnäytetyössä keskitytään erityisesti taudin havaitsemiseen ja ehkäisyyn.

Avainsanoja: tuberkuloosi, gynekologia, obstetriikka, kätilötyö, äitiyshuolto

1 INTRODUCTION

Tuberculosis (TB) has had a great impact on people in Finland from the 1940s to 1950s. It was a common disease among Finns up to the late 1960s. In the 1970s and 1980s the amount of patients was heavily decreased due to better medications. (Hautamäki 2002, 19.) Today tuberculosis raises its head again all over the world. In Finland the prevalence of tuberculosis was 7.7 persons per 100 000 inhabitants in 2009 (THL 2010). This is still little compared to for example Russia where in 2007 approximately 110 cases of TB per 100 000 was diagnosed. Furthermore, it has been estimated that one in five people have latent TB there. (USAID 2009.)

Tuberculosis has been mostly the problem of the undeveloped countries but it is coming more prevalent in the developed countries as well. People have almost forgotten its existence. The facts and know-how about the disease have disappeared within the years passed. This applies, not just the medical personnel in general, but also midwifes. Today it is again time to reawake the information forgotten.

This thesis discusses tuberculosis both in general and especially from the gynecological and obstetrical viewpoint in maternal welfare. The focus is on pulmonary tuberculosis which is the most common form of this infection. Every year Finland is receiving more and more immigrants from developing countries and in general high prevalence TB countries. This work consists of the thesis itself as well as of the booklets (in English and Finnish) which summarize the work. The booklet is meant for self study material for midwifery students and to support midwives in their work.

The thesis continues by stating the purpose, tasks and the objective of the study, followed by a survey on its theoretical and functional characteristics. A short survey is devoted to a midwife as a counselor. The rest of the thesis is organized as follows. We start discussing tuberculosis in general. The disease, its history and the current situation are introduced. The rest of the thesis is devoted to tuberculosis from the gynecological and obstetrical viewpoints. More

specifically, it is concentrated on tuberculosis in pregnancy, childbirth and puerperium. Concluding remarks are given in Section 11.

2 PURPOSE, TASKS AND OBJECTIVE OF THE THESIS

The purpose of this bachelor's thesis is to prepare a literature review on tuberculosis especially from the gynecological and obstetrical viewpoint. The focus is on pulmonary tuberculosis which is the most common type. A booklet is created based on the review and it summarizes the theory. This booklet will offer the information in an understandable way and is written in English and Finnish.

Thesis explains facts about the disease, history and current situation. Multi-resistant tuberculosis and the BCC-vaccination have also been included. General facts are followed by tuberculosis in gynecology and obstetrics. The chapters are tuberculosis and pregnancy, tuberculosis in childbirth and tuberculosis with a breastfeeding mother.

Research questions are:

1. What is tuberculosis and what are its risk factors?
2. What is its role in gynecology and obstetrics?
3. How to detect and prevent it from spreading?
4. What is the role of a midwife in prevention of tuberculosis?

The objective of this thesis is to educate midwifery students and support midwives in their work to detect tuberculosis and prevent the spreading of this disease to pregnant women, other patients and babies. The booklet can furthermore enrich the care at maternity wards and clinics.

3 LITERATURE REVIEW AS BACHELOR'S THESIS

Literature review can be defined as a theoretical research based on a chosen subject. The review creates new information by combining results of previous studies on the topic. The objective is to find out from different point of views what information there already exits. The links between previous studies are explored. Review is concentrated on literature, articles and other publications concerning the chosen subject. There has been criticism on literature review quality being variable and therefore it is of utmost importance to evaluate the reliability and authenticity of the literature used. (Tuomi 2007, 82-83.)

This bachelor's thesis is a literature review on tuberculosis. The focus is on gynecology and obstetrics aiming to produce a guide booklet for midwives and midwifery students. Information has been collected from different books, Internet, interviews and medical articles. The vast majority is from the year 2005 or newer updated sources. Special attention is paid to verify the original references and their being authentic and trustworthy. The point is to map the relevant data from tuberculosis today.

There is a need in midwifery education and to know more about TB, its symptoms and prevention in a pregnant woman. This bachelor's thesis is consisted of updated and researched information on TB and it is all of utmost importance to know when working in any of the fields of midwifery. The research questions and the purpose of the thesis appointed to preparing a literature review on this topic.

This bachelor's thesis has characteristics of theoretical and functional thesis. It deepens the special expertise of midwifery students (and midwives) on the topic and consequently develops their professional practices and skills.

4 A MIDWIFE AS A COUNSELOR

According to Kätilöliitto (2010) a midwife is defined as a person who has attended regularly in a midwifery education. This education has to be approved in the country and the person must complete it successfully and for by so doing has achieved the competence to become certified as a midwife. This professional must be able to give care and guidance during pregnancy, childbirth and postpartum. A midwife handles deliveries on her own responsibility and takes care of the newborn. All this includes preventative measures, emergency situations and informing the doctor.

A midwife has an important role in being the entire family's counselor giving health education. A midwife's own field of work is to promote especially sexual and reproductive health including women of all ages. In order to provide good midwifery, a midwife must give counseling, offer information and interact in a professional way with a client coming from different cultures. (Pienimaa 2007, 28-29.) A midwife is obligated to follow absolute confidentiality concerning the client's life and medical history. To crystallize, a midwife is a woman's personal counselor, advisor and support. Professional ethics is based on respecting human dignity and woman's right to decide on her own care. (Väyrynen 2007, 33-35.)

Midwifery is lead by values and principles. They are holistic care, the right to self-determination, equality, individualism, safety, and health promotion, continuity of care, responsibility, family-orientation and independency. (Väyrynen 2007, 35.) A responsible midwife updates her skills and expertise continuously. This creates sense of security and trust in the client. (Äimälä 2007, 39-43.)

The woman is the expert of her own life making choices and decisions based on her knowledge and experiences. The midwife provides woman with information and advice of her own best expertise with respect to the client. The woman has the right to get the information and counseling from the midwife and then decide on her own what to do or to choose. This is called an informed choice. It is important to share the information in a pleasant atmosphere without any

interruptions. Interaction is best when trust and individuality are present in counseling. The goal is to create equality and respect between the woman and the midwife. A midwife should work for the woman's own feeling of empowerment. This leads to self-determination and self-respect in the client. (Äimälä 2007, 39-43.)

A midwife's role in detection and prevention of tuberculosis is of great importance. In maternity clinics the THL's "BCG-vaccination risk group -inquiry" is offered to all expectant mothers. It has been used since the systematic vaccinations to all newborns were terminated. This inquiry should be updated to cover the parents' family, work place and closest friends in screening for potential infectious TB cases.

A midwife must be alert and aware of TB at all times at all work stations. Tuberculosis is reawakening and it could appear under any time of pregnancy, delivery or puerperium. Symptoms of TB for non-pregnant persons are normally clear, but with pregnant women not easily identified. A midwife must observe the mother and the baby for any indications of TB and notify her concerns to the physician. During the first months and year the newborn is very prone to infections, especially to TB. A midwife must remember this in counseling the mother.

5 TUBERCULOSIS

5.1 What is tuberculosis?

Tuberculosis is an airborne disease caused by mycobacteria. Mycobacterium tuberculosis infects humans, whereas Mycobacterium Bovis horned-cattle and humans. Both bacteria are included in the Mycobacterium Tuberculosis complex which includes also Mycobacterium Africanum and Microti. The bacilli are vital and endure drought, cold, acids, bases and several disinfectants. However, they are eliminated by boiling water instantly and within 10 minutes in 70 degrees Celsius. Exposure to direct sunlight does the same. (Kinnula, Tukiainen & Laitinen 1997, 465.)

The most common form of tuberculosis is the pulmonary one. The classical symptoms are dry, non-productive cough (at an early stage), sputum-like or bloody cough (later stage), increased coughing, chest pains, shortness of breath, local wheezing cough, general malaise, fatigue, anorexia, weight loss, night sweats and low-grade fever. Symptom-free tuberculosis is also a possibility at an early stage. Elderly patients have less pronounced symptoms than younger patients. (Kinnula et al. 1997, 470; Niederman & Sarosi, 2000; Small & Fujiwara 2001; Smeltzer & Bare 2004, 534.)

Assessing and diagnostic findings of tuberculosis include a physical examination, complete medical history, tuberculin skin test (Appendix 1.), chest x-ray (Appendix 2.), acid-fast bacillus smear and a sputum culture. The x-ray reveals lesions in the upper lobes and the smear contains mycobacterium. (Smeltzer & Bare 2004, 534.) Tuberculin testing is done, chest x-ray is taken and possibly bacteriological studies are made to diagnose TB. Further examinations will be carried out at a specific clinic for pulmonary diseases where the patient is referred by her physician or gynecologist. Patient who has an acute outburst of tuberculosis is to be treated in the specialized hospital or unit in isolation. (Maasilta & Salo 2007, 1-3.)

Extra pulmonary forms of tuberculosis are difficult to diagnose. The bacteriological examinations usually provide negative results. Other than pulmonary manifestations of TB are for instance tuberculosis of the lymph nodes. This is the second most common form. The outburst of the disease is mostly a reactivation of an old infection. Tuberculosis of the central nervous system is an acute emergency. It manifests itself mostly as meningitis. IV medications are administered and it is crucial to remember that recovery rate is only 20% if patient is unconscious, has fever, convulsions appear and has symptoms of paralysis. (Kinnula et al. 1997, 472-475.)

5.2 Risk factors

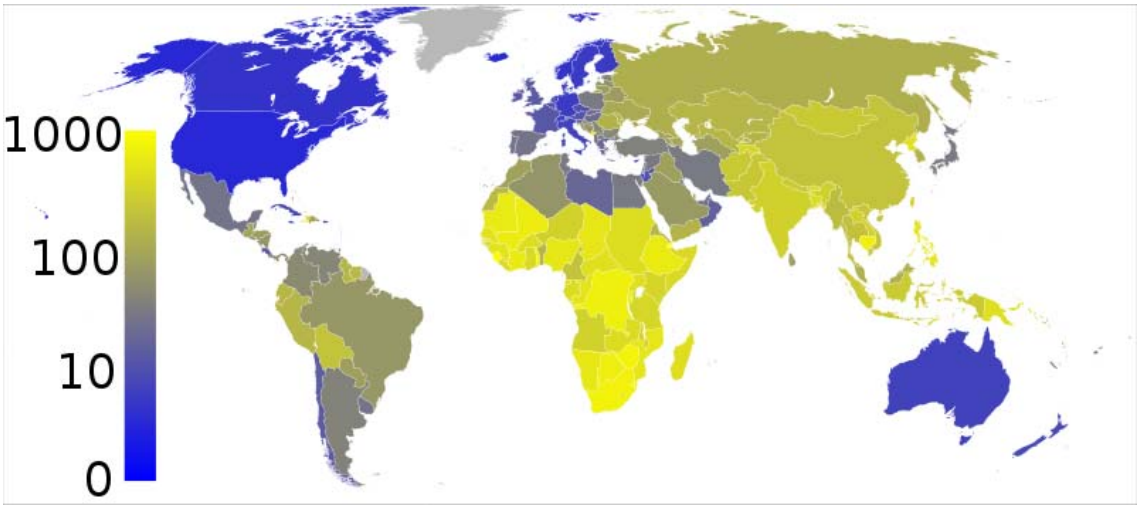
Tuberculosis is infectious, but not especially infectious. It is contagious only man to man not via articles. Only the persons who have tuberculosis in the lungs or in the larynx and have enough bacteria in their sputum are infecting others. (Kinnula et al. 1997, 464.) Bacilli must be at least 10 000-100 000 pieces in the sputum smear for a person to be infectious. If only the culture is positive the risk is minimal. Efficient chemotherapy reduces the number of bacilli substantially and the risk if infection is reduced remarkably after couple of weeks. (Maasilta & Salo 2007, 1-3.)

The risk of an infection by TB is related to the infectiousness of the person with TB, the duration of exposure, the susceptibility of those exposed the proximity to the source person and the efficacy of air conditioning. The risk of infection in public places and transport is low, but it is possible during long, over eight-hour flights. (WHO 2008.)

An individual who has good health, correct nutrition and sufficient hygiene is at a less risk of getting the infection (Ruutu & Soini 2007). Tuberculosis is connected usually with poverty, malnutrition, overcrowding, substandard housing and insufficient health care. An infectious person releases droplets by talking, coughing, sneezing, laughing, or singing which the victim inhales. Active disease is also possible by reinfection and activation of dormant bacteria. About 10% of patients who are initially infected develop active tuberculosis. (Smeltzer

& Bare 2004, 532-533.) This tells that 90% remain healthy carriers for the rest of their life. Tuberculosis is a common disease especially in the Southern and Central Africa and Eastern Europe (Ruutu & Soini 2007). In Finland, the majority of TB patients is over 65 and has a reactivation of the disease. (Kinnula et al. 1997, 465.) However, it is coming more prevalent in all ages due to immigrants from high-prevalence countries (Figure 1.).

FIGURE 1. Estimated prevalence of tuberculosis per 100,000 people in 2007, per country (WHO 2009.)



As emerged tuberculosis infection usually does not happen instantly. If a person spends a lot of time with an infected person and inhales a lot of nuclei from her the risk of infection rises high. These people are mostly family members, colleagues or other patients. (Hautamäki 2002, 41; Smeltzer & Bare 2004, 533.)

Immunocompromised individuals are even at a higher risk compared to healthy ones. An individual at higher risk can be a person having cancer, HIV-infection, organ transplantation or receiving prolonged high-dose corticosteroid treatment. Substance abusers and people without sufficient access to health care (homeless and poor), people with a co-existing disease such as diabetes, chronic renal failure, poor nutrition, malignancies and hemodialysis are at risk. Being a health care worker working with risk groups also exposes to the infection. (Smeltzer & Bare 2004, 533.)

5.3 Background and history

The mycobacteria have probably always been present, perhaps ever since 5000 B.C. Mycobacterium tuberculosis was discovered by a German physician Robert Koch, with his microscope in 1882. He prepared an extract called tuberculin from the bacteria. The purpose was to develop a vaccine but to his disappointment it was not useful. Nowadays tuberculin is used in diagnostics. (Kinnula et al. 1997, 463.)

It was not until 1944 when an American biochemist and microbiologist Selman Waksman discovered streptomycin. In 1946 another milestone was reached when a Swedish chemist Jörgen Lehmann found another medicine called para-amino salicylic acid. These two were the first effective medications to eliminate tuberculosis. (Kinnula et al. 1997, 463.)

In Finland hospitals provided by the state were built from the mid 1800s. The care of patients with tuberculosis was still supported by the private sector at that time. Funds from the state for their treatment were granted since the 1930s and special sanatoriums were built for these patients. The very first sanatorium was build by the Finnish Medical Doctor association, Duodecim. Funds were collected from the citizens. (Hautamäki 2002, 39, 41.)

The patients were temporarily isolated from the society and the units were very independent. Patients came from all ages and statuses. The sanatoriums offered education on disease control and health promotion. Treatments were fresh air, healthy food and surgical procedures. Patient hygiene and cleanliness were highly respected and valued. The results were generally positive and afterwards patients could return to their normal life; to work and to the society again. The sanatoriums were operated until the 1960s. The meaning of the sanatoriums was diminished in the 1940s due to better antibiotics and in the 1960s it was general to receive the treatment at home. (Hautamäki 2002, 39, 41-42, 53-54.)

The isolation concerned also children whose parents were sick with tuberculosis. In most of the cases it was the mother who gave up her newborn baby to a so called “joulumerkkikoti” (a home for children of parents suffering

from tuberculosis). For the child that meant isolation from the family. The point in isolation was to reduce the risk of infecting the children by the parents. (Hautamäki 2002, 54.)

Sending small children to the homes must have been hard for the mothers but it was inevitable from the point of view the society. More important than personal feelings was common good. (Hautamäki 2002, 55.) The last of these homes was closed in Tampere in 1973 (Teramo 2003).

6 TUBERCULOSIS TODAY

Today tuberculosis is classified as generally hazardous infective disease which means that this disease is treated whether the patient is compliant or not. According to Finnish law the patient can be admitted to a hospital against her wishes for maximum of two months (Hautamäki 2002, 43).

6.1 Prevalence of tuberculosis

It was the year of 2003 when the WHO (the World Health Organization) took the step to declaring tuberculosis as a global emergency. The disease was out of control in several parts of the world. Approximately one third of the world's population had got the infection and almost nine million people became sick with this disease every year. (The European Health Report 2002, 23-24.) In 2008, an estimated 11.1 million people were living with TB, a prevalence rate of 170 per 100 000 population (WHO 2010). Tuberculosis is curable but about 1.6 million people die from TB and 8 million new cases are diagnosed. (The European Health Report 2002, 23-24.). Of the patients 95% are in the undeveloped countries. In principle, effective, low-cost treatment is available, but not everybody in need has the access to it. (Advocacy to Control TB Internationally 2007, 3.)

Nearly one third of HIV patients are also been infected with tuberculosis. It has been estimated that more than two million people die each year from HIV and TB's lethal combination, both of which speed the other's process. The worst situation is in the sub-Saharan Africa. (Activity Report 2007, 14.)

There are a lot of challenges for efficient control of tuberculosis. These are health sector reform, prevention of disease and control in the prisons and last but not least education of the health care professionals. There is a need for assistance from the international community and donors. The epidemic has to be put under control. (The European Health Report 2002, 26.)

In Finland in 2006, 293 new cases of TB were diagnosed. The prevalence was 5.6 per 100 000 inhabitants the same year. Pulmonary tuberculosis cases there were 210 and the prevalence of this form of TB was 4.0. (Appendix 3.) To compare to situation in 2009, the number of TB cases was 411 and prevalence 7,7 per 100 000 inhabitants. The majority (295) was pulmonary cases. (THL 2009.)

6.2 Drug-resistant tuberculosis

When effective medications against tuberculosis were discovered they were used commonly and without strict observation. Some people interrupted the course of antibiotics or took insufficient dosages of the medications. Over the decades the mycobacteria developed resistance against these drugs. New medications have been discovered but mycobacterium tuberculosis has evolved as well.

The drug-resistant (DR-TB) TB is caused by mycobacteria tuberculosis that are resistant to at least one of the basal anti-tuberculosis drugs and possibly to others but it is still not referred as the multiresistant type (Rajalahti &Valve 2007). The multidrug resistant TB (MDR-TB) is caused by mycobacteria tuberculosis that are resistant to at least isoniazide and rifampin. These two are the most important first-line medications. The third, life-threatening form of TB is called the extensively drug-resistant TB (XDR-TB). It is caused by mycobacteria tuberculosis that are resistant to isoniazide and rifampin and to any of the fluoroquinolones and at least one of the following second line anti-TB-drugs: amikacin, kanamycin or capreomycin. (Martinez 2008. 14-15.) At the highest risk of developing the multidrug resistance are the HIV-positive, homeless and institutionalized people (Smeltzer & Bare 2004, 535).

The multidrug resistant tuberculosis is more difficult and nearly 100 times more expensive to cure compared to non-drug resistant form. The MDR-TB is a major problem especially in prisons and other long term care facilities. (The European Health Report 2002, 24.) WHO (2008) estimates there are almost half a million new cases of MDR-TB per year. The highest rate was recorded in Baku (the

capital of Azerbaijan) where close to a quarter of all new TB cases (22.3%) were reported as the multidrug-resistant type. Among new TB proportions of MDR-TB cases were 19.4% in Moldova, 16% in Ukraine (in Donetsk), 15% in the Russian Federation (in Tomsk Oblast), and 14.8% in Uzbekistan (in Tashkent). These rates are surpassing the highest levels of drug resistance published in the last WHO report in 2004. In China also, surveys suggest that MDR-TB is widespread. (WHO 2008.)

A patient suffering from multiresistant tuberculosis is treated in strict isolation under supervision in a specialized hospital unit. The combination of four drugs (isoniazide, rifampin, pyrazinamide and ethamputol) is used to start the treatment and the medication is revised after knowing more about the resistant strain. (Mustajoki, Alila, Matilainen & Rasimus 2007, 125.)

The extensive drug-resistant form XDR-TB has been identified worldwide but the highest levels are found in Asia and the countries of the former Soviet Union. For instance, when in the USA 4% of MDR cases met the XDR-criteria, in Latvia, one of the countries of the highest MDR rates the criteria was met by 19% in 2000-2004. (WHO 2006.)

XDR-TB poses a serious public health threat especially in countries with high rates of HIV and few health care resources. So, given the underlying HIV-epidemic drug-resistant tuberculosis could have a severe impact on mortality in Africa even though population prevalence of drug-resistant TB appears to be low compared to Asia and Eastern Europe. (WHO 2006.)

If the patient has developed resistance to isoniazide and rifampin, the recovery is unsure. The treatment for a resistant strain as mentioned above is expensive and time consuming (Maasilta 2008). In case the medications are failing to eliminate TB, the disease is becoming fatal. Mortality rate is 50-60% at this point, the same as before discovering the medications. (Kinnula et al. 1997, 479.)

In Finland drug-resistant TB is still relatively rare. According to Soini (2005) in 1998-2004 5% of all mycobacterium tuberculosis cases were drug-resistant, of

which only 0,5% met the MDR-criteria. Drug effectiveness has been approximately 95 % within seven years. (Table 1.)

Table 1. M. tuberculosis -strains drug-resistance and -effectiveness 1998-2004 (Soini 2005.)

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**Total**
	--- (%) ---							
All cases of M. TB	413	402	450	406	383	357	261	2 672
Drug effective-ness	398 (96.4)	385 (95.8)	427 (94.9)	378 (93.1)	361 (94.3)	339 (95.0)	249 (95.4)	2 537 (94.9)
DR	15 (3.6)	17 (4.2)	23 (5.1)	28 (6.9)	22 (5.7)	18 (5.0)	12 (4.6)	135 (5.1)
MDR	2 (0.5)	0 (0.0)	2 (0.4)	4 (1.0)	3 (0.8)	3 (0.8)	0 (0.0)	14 (0.5)

In 2009 in Finland MDR-TB was discovered in six patients (2% of all infected with TB) reflecting increasing immigration from high-prevalence-TB countries. Drug sensitiveness was 93% of all cases the same year. So far there have not been any XDR-TB cases. (THL 2010.)

6.3 Prevention and treatment

6.3.1 The BCG-vaccine

People can be protected from TB by vaccinating and by giving prophylactic medication to people at risk. The BCG-vaccine (Bacillus Calmette-Guérin) developed to reduce the risk of tuberculosis contains a live strain of attenuated Mycobacterium bovis. The BCG is the oldest vaccine in the world still used today. First used in France in the 1920s, the vaccine has been used widely since 1950 on an international level. This vaccine does not actually protect from the infection or does it give full protection against a new infection but it prevents

its spreading in the body. There is evidence that the vaccine when administered correctly to neonates clearly reduces the risk of serious infection. (Ruutu & Soini 2007; Kinnula et al. 1997, 480, 482; Hey 2006.)

All vaccines have side effects and potential adverse effects. The BCG -vaccine produces a pimple at the site of vaccination often slightly enlarging the lymph nodes in the surrounding area. This pimple bursts and discharges after a few weeks, leaving a scar. This is a normal reaction to the vaccination. In 1-2 children out of each 1,000 vaccinated, the BCG vaccine has caused abscesses on the groin lymph nodes. These abscesses appear 3-7 months after vaccination. This does not demand any special treatment or increase the risk of more serious harm. (THL 2009.)

Adverse effects of BCG vaccination are remote infections arising far from the site of vaccination. Bone and or joint inflammation, skin infection and generalized BCG infection are included. These conditions have been diagnosed in 14 out of each 100,000 vaccinated children. Remote infections are treated using tuberculosis drugs. A small percentage of joint and bone inflammation caused by this vaccination may remain as permanent disorders. Infections appear on average 14 months after vaccination. (THL 2009.)

BCG-vaccine should not be given to individuals allergic to any of the compounds in the vaccine. Contraindication is also fever. The vaccine should not be given to individuals who are on corticosteroids, are having immunosuppressive therapy (including radiotherapy), having malignant tumors or HIV-infection (including babies of HIV-positive mothers). The effect of the vaccine can be excessive and in this case general BCG-infection is possible. Areas that have high incidence of tuberculosis, vaccinating symptomless HIV-patients is relevant according to the WHO. There is no clear evidence for how long the vaccine gives immunity against tuberculosis but there are indications of it’s weakening after ten years. (Pharmaca Fennica 2009.)

The systematic BCG -vaccinations in Finland were launched in the 1940s. The BCG vaccine used for a long time in Finland, had to be discontinued in 2002, the manufacturer ceasing production. It had been discovered that the new

vaccine caused more side effects than the previous one. (THL 2009.) Since 1.9.2006, the protocol has been to vaccine only babies at the risk groups. (Ruutu & Soini 2007; Kinnula et al. 1997, 480, 482.)

6.3.2. Medications

In Finland the standard treatment for tuberculosis is isoniazide (INH) and rifampin (RMP) for six months. The third medication for the first two months is often pyrazinamide (PZA). An alternative to pyrazinamide is ethamputol (EMB). The patient takes all the medications at the same in the morning. (Maasilta 2009.) In case patient has tuberculosis induced meningitis the treatment is on average 12 months. The medical therapy may continue for 9-18 months if some of these drugs cannot be used because of side effects. (Rajalahti 2007.) For the patient all the medications for treating tuberculosis are free of charge in Finland (Maasilta 2009).

Almost all medications have undesired side effects. This applies also to antituberculosis drugs. For instance isoniazide can induce rash, fever, seizures, irritability, pins and needles -sensation and liver reactions. For pins and needles sensations Heksavit (vitamin B6) is given prophylactic. Rifampin reduces the effect of certain medications (for instance warfarin) and even contraceptives loose some of their effect. These are important issues to tell the patient. Side effects with this drug can be digestive problems, rash, symptoms of the Flu-syndrome and dyspnea. Feces, sweat, urine and even contact lenses will discolor to brownreddish. Pyrazinamide causes joint aches, skin reactions, digestive problems (anorexia), liver problems and sensitivity to light. One of the side effects can be gout. Ethamputol may pose a risk of optic neuritis and other side effects such as joint aches. Streptomycin is ototoxic and may contribute to renal failure. Skin reactions and fever are also common with this medication. (Rajalahti 2007; Maasalmi 2009; Matilainen & Lientola 2007, 123-125.)

Extra medications are taken according to secondary symptoms (drug induced). For dyspnea salbutamol is recommended. Cough medication can be taken for cough symptoms. Sputum secretion can be treated with bromhexidine and

difenhydramine. For nausea metoclopramide is effective. If the TB -patient is on warfarin therapy, the dosage of anticoagulants is usually set higher. A diabetic can suffer from changes in blood sugar levels. (Rajalahti 2007; Maasalmi 2009; Matilainen & Lientola 2007, 123-125.)

Multidrug resistant tuberculosis can be prevented by taking medications strictly according to doctor's orders. However, if this is the case then the medical therapy is started with four antituberculosis drugs. The list of medications is revised after knowing more about the resistant strain. (Maasilta 2009.)

TB chemoprophylaxis is medical therapy for the patient being exposed to TB. This method is widely used in the United States since Americans do not usually administer the BCG-vaccine. In most cases isoniazide is used regularly for six months. With this two thirds remain healthy. Hepatitis related to taking isoniazide is 1 % of all patients. The risk is higher with age. Other medications can be added. For immunosupressed persons the prophylaxis seems to work well but sometimes it needs to be continued for the rest of their life. People being exposed to TB, are re-examined in 6, 12 and 24 months. Of relapses 80% occur within two years. (Kinnula et al. 1997, 469, 480-481.)

Before starting and during the medication therapy laboratory values are monitored at least on a monthly basis. These include values that concern blood, functions of the liver, pancreas and kidneys. Urineanalysis is standardly taken as well. Chest x-ray is taken before starting the treatment and after two and six months. It can be taken more often if the patient's condition deteriorates. Sputum smears and cultures are monitored on a regular basis. The first and the most important task is to sort out whether the strain of TB is resistant to any of the most commonly used drugs. (Maasilta 2009.)

7 TUBERCULOSIS AND THE GYNECOLOGICAL PATIENT

An important form of extra pulmonary tuberculosis in the need of gynecological and obstetrical consideration is urinary and especially genital tuberculosis. Genitourinary TB is often a late manifestation of an earlier symptomatic or asymptomatic pulmonary tuberculosis infection (Pasternak & Rubin, 2001; Langemeier 2007, 279). A latency period from 5 to even 40 years between the time of the initial infection and the expression of genitourinary TB may occur (Gibson, Puckett & Shelly 2004; Langemeier 2007, 279). There are factors known to increase the reactivation of this infection. Uncontrolled diabetes, leukemia, Hodgkin's disease, acquired immunosufficiency syndrome and advanced age are included in the risks as well as treatment with corticosteroids or immunosupressants (CDC 2005; Langemeier 2007, 280).

Urinary TB is almost asymptomatic at first. Some of the possible symptoms can be difficulties to urinate, nocturia and pelvic pain. Classical symptoms are aseptic pyuria, proteinuria and hematuria. (Kinnula et al. 1997, 472-475.) Primary infection of the female genital organs is most often hematogenous and very rarely possible from sexual contact (Gupta, Sharma, Mittal, Singh, Misra & Kukreja 2007, 136).

Pregnancy is rare in the presence of genitourinary tuberculosis and may be complicated by spontaneous abortion or ectopic pregnancy (Khan, Chandramohan & MacDonald 2004; Langemeier 2007, 281). A warning sign for genitourinary TB is a history of recurrent Escherichia coli infection (Langemeier 2007, 281). Genital tuberculosis in women is most often localized in the mucosa of the uterus and in the follicle tubes. It can be the reason behind abnormal menstruation or infertility. Nevertheless it is possible after the menopause as well. (Kinnula et al. 1997, 472-475.)

Urine samples of three following mornings are examined. Ultrasound of kidneys and CT are used in diagnostic procedures (Kinnula et al. 1997, 472-475). In some cases radiography and intravenous urography can be helpful in investigating the extensiveness of the infection (Langemeier 2007, 281). A sample of menstrual blood or dilatation and curettage -sample is used for

bacteriological and histopathological examinations. An endoscopic examination (laparoscopy) is a possible sample collection tool as well. Irregular menstruation and ascites implicate cancer but surprisingly TB can be the reason behind these symptoms. (Kinnula et al. 1997, 472-475.) Surgery (total abdominal hysterectomy with bilateral salpingo-oophorectomy) is usually not recommended but may be required if the woman does not desire more children or she does not respond to medical treatment (Gupta & al. 2007, 137).

The medical therapy is the same for genital or urinary TB as for pulmonary tuberculosis. In the worst cases urinary TB may lead to kidney failure and to destruction of the kidney. In the case of genital tuberculosis the worst outcome could be infertility as discussed before. (Langemeier 2007, 279.)

8 TUBERCULOSIS AND PREGNANCY

8.1 Tuberculosis in pregnancy

Pulmonary as well as extra pulmonary tuberculosis is possible during pregnancy. Lymphadenitis, a form of extra pulmonary tuberculosis has no adverse effect on the maternal and fetal outcome, whereas for instance intestinal, spinal, endometrial and meningeal TB are associated with an increased frequency of maternal disability, fetal growth retardation and babies with low Apgar scores. The management of this disease during pregnancy needs special attention. The maternal and fetal healths are both affected. Diagnosis with TB includes hazards such as radiotherapy and medications. Untreated tuberculosis sets both parties in jeopardy. (Khilnani 2003, 105-106.) The incidence of tuberculosis in pregnancy is on the increase in the developed countries as a result of immigrants (Ormerod 2001, 494).

There is interaction between tuberculosis and pregnancy. A woman can have tuberculosis and then get pregnant or she may become infected during pregnancy. Some researches suggest that pregnancy is a risk factor for acquiring TB (Ormerod 2001, 494). Pregnancy alters the immune response and therefore unusual manifestations of tuberculosis appear more often than with a non-pregnant person. Particularly when associated with poor nutrition, immunodeficiency and/or coexisting disease TB may flare up. (Adhikari 2009, 234; Arora & Gupta 2003.) In pregnancy the prevalence of tuberculosis is from 0.3% to 1.9%. Pregnancy during TB infection may influence on the outcome of pregnancy. Gestation has been variously reported to worsen, to improve or have no effect on TB. This disease may in some cases get worse during pregnancy and even lead to miscarriage. (Davis, Seward & Marcy 1999, 761; Rigby 2000, 284.)

In most cases, however, pregnancy does not change the course of acute tuberculosis nor does it pose a risk for reactivation of the disease. Nevertheless the pulmonary or extra pulmonary tuberculosis on pregnancy includes prematurity, low birth weight, miscarriage and perinatal death. These cases

were more common among pregnant women who were diagnosed late, had incomplete or irregular treatment or suffered from advanced disease. Obstetric morbidity is increased four fold and preterm labor nine fold if carrying mother was diagnosed late. (Pearlman, Tintinalli & Dyne 2003, 162.)

The signs and symptoms of tuberculosis are mostly the same for a pregnant woman than for any other patient: cough, weight loss, fever, malaise, fatigue and hemoptysis. Nevertheless it is more likely to a pregnant woman to have an asymptomatic disease than for a non-pregnant person. The early diagnosis of tuberculosis is often postponed due to the fact that pregnant women are not likely to have a chest-x-ray to confirm the infection. This is why expectant mothers, who are in the risk group of having tuberculosis, should be targeted for screening. The safest test to be performed during pregnancy is the Mantoux test, also called the tuberculin skin test. If the test is positive, a chest x-ray should be taken with shielding. This procedure exposes the fetus to most minimal amount of radiation. (Pearlman et al. 2003, 162.) For not so long in Finland physicians diagnosing TB on a pregnant woman have used a blood test called IGRA (B-TbIFNg). It is a newly discovered immunological screening method where in patient's blood sample is indicated TB antigens sensitive T-lymphocytes. (Laboratoriokeskus, 2011.)

8.2 Prevention before and during pregnancy

Prevention of tuberculosis before and during pregnancy is of utmost importance. To remain healthy a pregnant woman needs to lead a healthy life. This means healthy eating habits, physical activity, moderate alcohol consumption (none during pregnancy) and tobacco-free life. Regular visits to maternity clinic are essential. In case a pregnant woman suspects to have been exposed to tuberculosis she must contact her health care provider for further examinations. An infective person can be anyone with active TB, a family member or a colleague.

It is essential to give counseling to future and especially expectant mothers of the effects of tuberculosis. If a woman planning a pregnancy belongs to the risk

group or already has the infection she should be informed about the TB and its effects on pregnancy. Should there appear any of the symptoms a mother needs to be referred to a specialist. There are always risks to pregnancy, even with a healthy mother. With tuberculosis, risks should be acknowledged and take measures accordingly to the pregnancy, weeks of gestation and symptoms.

It would be important to start screening TB from immigrants coming from high prevalence TB countries. Especially fertile adults and pregnant women could be targeted for screening and method could be the Mantoux test. Positive results should be referred to further examinations and persons with negative results could have an info meeting and a brochure to take home. In pregnant clients, a negative Mantoux test result should not lead to a BCG –vaccination, even though there is evidence that there are no side-effects to the fetus. However, the vaccine can be administered to the mother if the risk of infection is high in the area and if the benefits overrun the risks. (Pharmaca Fennica 2009.)

The four basic drugs to treat tuberculosis – isoniazid, rifampin, pyrazinamide and ethamputol – are all safe to use in pregnancy. They are not teratogenic to the fetus. Potentially ototoxic for the baby are streptomycin and aminoglycosides and should not be used. Instead, P-amino salicylic acid has been safe. Ethionamide and protionamide are teratogenic inducing premature labor and therefore not recommended. It is very important to remember that active tuberculosis in pregnancy must always be carefully treated. Untreated TB is more harmful than the drugs for the mother and the baby. (Toman & Frieden 2004, 166.)

8.3 Drug-resistant tuberculosis and pregnancy

Perhaps one of the worst scenarios in tuberculosis in pregnancy is that the first line drugs are not effective against the disease. The second line drugs will be introduced but the pregnant woman should be informed about the risks to the fetus. In the early weeks of pregnancy physicians may propose the option of abortion to a woman diagnosed with drug-resistant TB. The reason behind this

is that the medications may be fetotoxic and or toxic for the pregnant woman as well. The side effects of the medications have not been studied enough during pregnancy. (Lessnau & Quarah 2003, 954.)

In spite of all that, an abortion needs not to be the only option. It has been reported a case of a pregnant woman diagnosed with MDR-TB who refused an abortion, received the second-line drugs and delivered a healthy neonate. (Lessnau & Quarah 2003.) There are no existing guidelines for the treatment in pregnancy and it has been suggested that the abortion could be considered elective while treating a pregnant woman with drug-resistant TB.

A Pregnant woman diagnosed with DR-TB in the third trimester is a case to be review by a team of medical professionals in order to start treatment in pregnancy or deliver the baby and then start the treatment on both parties. A pregnant woman with drug-resistant tuberculosis has an increased risk of neonatal complications, a disease with more extensive radiographic changes and longer sputum conversion times (Khilnani 2004, 106).

9 TUBERCULOSIS IN CHILDBIRTH

9.1 Risks in childbirth

An outbreak of tuberculosis is possible also close to childbirth. A woman diagnosed with TB late in pregnancy has to have the medical treatment started instantly. However, since the diagnosis is confirmed this close to delivery the medications are not yet effective to prevent infecting the medical personnel or the unborn baby. The staff in the delivery room as well as in the operating room must always be prepared since a pregnant woman with open TB infection may be admitted to hospital at day or at night. Normally, a pregnant woman diagnosed with TB is followed up by maternity clinic and the risks of infection are monitored. The childbirth is planned well and managed in isolation. (Kalvas 2009.)

Nakanishi, Moritaka and Ueda (2004) report a case of a 29-year-old pregnant woman diagnosed with tuberculosis. She was admitted to hospital at 35 weeks of gestation. The treatment was started with isoniazide, rifampin and pyrazinamide. After 21 days with chemotherapy a caesarian section was carried out. In this way the risks of infection were minimized.

9.2 Protection and prevention against the infection

Only those women giving birth that have pulmonary tuberculosis are potentially infectious. However after two weeks of treatment including rifampin and isoniazide the person is no longer considered infectious. The mother can then be allowed to give birth naturally. A small potential risk arises if the pregnant woman is diagnosed later than two weeks prior to birth and she is sputum smear positive for acid fast bacilli. A new threat arises if she has DR-TB. Risk factors for having this should be evaluated and molecular tests for rifampin resistance done. If resistance is diagnosed, the staff is to use dust mist fume masks and the mother is isolated in negative pressure ventilation room. (Ormerod, 2001, 496-497.)

As mentioned above a mother diagnosed with tuberculosis is a risk not just to the unborn baby but to the health care personnel and other patients as well. Adequate protection must be used. If the infection is in the lungs and in acute phase, the baby needs protection and later on prophylactic medication. The personnel in the delivery room are prepared to prevent further infection to other expectant mothers and staff members.

A route of infection of the fetus before or during child birth is from aspiration of infected amniotic fluid to direct contact with mycobacterium induced cervicitis or endometritis (Ormerod, 2001, 497). Genital TB is so rare in Finland that there is no official protocol for how to manage delivery with a woman diagnosed with it. According to Palomäki (2009) a caesarian section could be useful in some cases if the infection is in the woman's birth canal.

The 29-year-old woman reported above returned to the tuberculosis ward after the caesarian section and ethamputol was added to her medication. The baby entered to the neonatal care unit after confirming negative tubercle bacilli in amniotic fluid. (Nakanishi et al. 2004.)

10 TUBERCULOSIS AND PUERPERIUM

10.1 Congenital tuberculosis

Pregnant women with TB expose their fetus to the infection. The progression from infection to disease is highest during the first year of life. It has been shown that mothers transmitting the disease all had pulmonary TB. (Adhikari 2009, 235.)

Congenital tuberculosis in neonates is potentially serious; however it is rare; fewer than 300 cases have been reported in the English literature. During pregnancy it is possible that tuberculosis may infect the placenta or the female genital tract. The infection may also be introduced hematogenously through the umbilical vein. Primary focus then develops in the liver involving the lymph nodes and the tubercle bacilli infect the lungs secondarily. On the other hand the fetus may be infected by aspiration or indigestion of amniotic fluid contaminated by genous dissemination of TB through placenta. (Khilnani 2004, 106; Rigby 2000, 289.)

Symptoms of congenital TB appear within two or three weeks postnatally. The signs of the disease are often non-specific. Respiratory distress and hepatosplenomegaly appear most often. Following symptoms are fever and lymphadenopathy. Abdominal distension, lethargy, irritability, ear discharge and skin lesions are possible as well. (Khilnani 2004, 107.) Investigations require specimens from different sites and they may have to be repeated. At first the tuberculin skin test may be negative, but within 4-6 weeks it becomes positive. Chest radiograph, CT, gastric aspirates, smears from the middle ear and bone-marrow aspirates may indicate acid-fast bacilli (ASF) (Table 2). Manifestation of TB in a newborn may lead to the diagnosis of the disease in the mother.

Table 2. Investigations for tuberculosis in the newborn

The Mantoux test (Tuberculin skin test)
Blood tests
Chest radiograph
Computerized tomography (CT)
Three early morning gastric aspirates/washings
Cerebrospinal fluid
Induced sputum
Gamma Interferone blood test (TB specific (TbIFNg)
Bronchoscopy

The mortality rate of congenital tuberculosis is high, reaching nearly 50 percent. The major causative factor is delayed diagnosis (Khilnani 2004, 107). Clinically, tuberculosis in the neonate simulates other congenital infections such as syphilis, cytomegalovirus or bacterial sepsis. The placenta should be examined and cultured for mycobacterium tuberculosis if there is any suspicion of this disease. (Ormerod 2001, 497.)

10.2 Tuberculosis and breastfeeding

The safety of breastfeeding is an important issue. Normally breast milk provides the best nourishment for a newborn. Breastfeeding promotes health and helps to prevent disease. This way the baby receives the first line immune defense from the mother. By nursing the baby it gives both - the mother and baby - a strong bond. Breastfeeding is encouraged but isolation is recommended if mother has infectious disease (Gibbs, Danforth, Karlan & Haney 2008, 293).

The first-line TB-drugs cross into breast milk in variable amounts. However, the amounts transferred to the infant are not usually significant. Consequently breastfeeding is not discouraged. Tuberculosis medications should be taken

preferably after breastfeeding and the next feed should be a bottle-feed. If the mother and baby are both on isoniazide medication it is possible that the drug reaches supratherapeutic doses and in that case bottle feeding is advised. Supplementary vitamin B6 should be given to the baby on isoniazide or if the mother is taking this same medication because deficiency of vitamin B6 can cause seizures in the neonate. (Khilnani 2004, 108.)

Active tuberculosis infection should be immediately, effectively and carefully treated with a breastfeeding mother. Prophylactic medication is to be considered for babies born to mothers with active pulmonary outbreak (Khilnani 2003, 105). The mother and baby may stay together despite the disease but the concentration of the anti-tuberculosis drugs in the breast milk is not sufficient to prevent or treat the infection in the baby (Pearlman et al. 2003, 162). The mother with open TB can still infect her baby transmitting TB by aerogenous route.

10.3 Protecting the newborn from tuberculosis

Perinatal tuberculosis occurs from airborne infection. The source can be own mother or family member or another infectious person the newborn has had close contact. (Ormerod, 2001, 497.) It is not recommended to give the BCG - vaccine to a mother during the time she is lactating. On the other hand, the vaccine can and should be given to the mother if the infection risk is high in the area and the benefits overrule the risks. (Pharmaca Fennica 2009.)

To protect the newborn from the infection, isolation from the mother can be considered if the outbreak is right after the birth. The treatment is started on both parties instantly and within two weeks after starting the medications the mother is considered no longer infectious.

For a new mother the instructions regarding tuberculosis are following the same formula as for a pregnant mother. If the mother has now an outbreak of tuberculosis she should immediately consult her health care provider. In the case of pulmonary tuberculosis this is all-important since it affects the baby

immediately. This is of course due to the fact that mother and baby live side by side for the first months. Baby, being exposed to infectious tuberculosis on a daily basis, is at risk of developing the infection. For a successful outcome it is crucial to follow doctor’s orders carefully.

11 CONCLUSIONS AND DISCUSSION

Tuberculosis used to be common in the Finnish population as far as the 1950s. The situation improved due to better care in the hospitals and new effective medications. TB used to be well-known among physicians and midwives to the late 1970s, but today being rarer, the symptoms of this disease are not well recognized or the disease suspected anymore. It would be crucial for midwives and student midwives to identify tuberculosis and especially infectious persons as early as possible.

Tuberculosis is coming more prevalent. At least 1/3 of the world's population have been infected, approximately 1,6 million dies because of it and eight million is diagnosed with TB. (The European Health Report 2002, 23-24.) In Finland also, TB is rising; in 2006 the number of new TB diagnoses was 293 and in 2009 already 411 (THL 2009). TB is arriving to Finland with immigrants from high risk areas; Russia, Estonia, Latvia and Africa. It has been estimated that one in every five Russians has latent tuberculosis infection.

Since tuberculosis is reawakening, international collaboration is essential to prevent spreading of the disease. Donations to undeveloped countries for TB control and prevention is an investment for the future. If the spreading of tuberculosis is limited also the battle against drug resistance is more controlled. International conferences are of great importance in training and educating medical personnel on TB. In the future there are problems needing to be solved. These are for instance the multi-drug resistant and the extensively drug-resistant variations of TB infection and the lethal combination of tuberculosis and HIV-infection. New medications must be discovered and above all new preventative measures must be taken.

Pharmacotherapy is efficient but resistant and extremely resistant strains and co-infection with HIV pose a new threat, for pregnant women as well. It is vital to contribute to research in order to find new medications against resistant strains of TB.

This bachelor's thesis was prepared using authentic and generally acceptable international and national references. Ethics and professional courtesy was respected. Finnish references have been used to map the relevant data on TB in Finland. It has been of great importance to use the newest and updated data.

This study concludes that of utmost importance is prevention of the disease, guidance, screening and vaccinations of risk groups. Immigrants from high risk areas should be screened by tuberculin skin test and people traveling in high risk areas should maybe be tested for tuberculosis on arrival back to Finland. Maternity clinics' nurses and midwives have an important role in detecting, testing and screening for TB. All midwives working in pre-, peri- and postnatal care must know about tuberculosis. This applies to midwifery students as well. In midwifery education in Finland TB is discussed very shortly and thus there exists a great need of education on tuberculosis detection and prevention. Since Finland is receiving fertile immigrants from high risk TB-areas, midwives working here must know about TB and give counseling to these immigrants.

Finding relevant information on TB is not easy. There is a lot of old and un-updated data on the topic, and too little new research. Tuberculosis in gynecology and obstetrics has been researched but only few studies exist so far. Most of the references are international and written for physicians.

The booklet offers an up-to-date package of essential information on TB for midwives and midwifery students. The information is meant to help midwifes recognize and prevent spreading of tuberculosis and further on educate their patients; give the advice and guidance in Finnish as well as in English.

Possibilities of further research on this field are unlimited. Studies could be conducted on congenital tuberculosis or tuberculosis with newborns. Research on tuberculosis and HIV co-infection during pregnancy and its prevention would be of great importance since it is a growing problem in the world today. Updating the booklet in the future is important as well. The booklet can be extended and updated according to new protocols.

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APPENDIX 1. Tuberculosis inquiry and tuberculin skin test (Cox 2007.)

SHARE WITH WOMEN

What is Tuberculosis?
Tuberculosis (TB) is an infection caused by bacteria. It usually affects the lungs, but it can also cause problems in other parts of the body.

I Do Not Know Anyone with TB. Is it a Big Problem in the United States?
TB is most common in Latin America, Asia, and Africa. Still, there are more than 10 million people in the United States with TB. Thousands of new cases of TB are reported every year. In the United States, more than 80% of all TB infections occur in persons who are members of racial or ethnic minority groups.

What are the Symptoms of TB?
The symptoms of TB are:
- A bad cough that lasts 3 weeks or more
- Pain in the chest
- Coughing up blood
- Feeling weak or tired
- Loss of appetite
- Chills, fever, or sweating at night

We are lucky that we have medicines to cure TB now. But if a person who has TB does not take medicine, they can die.

How is TB Spread?
When a person who has TB breathes out, the bacteria go out into the air. People who breathe in the bacteria from the air into their lungs may become infected. TB is not spread by sharing food.

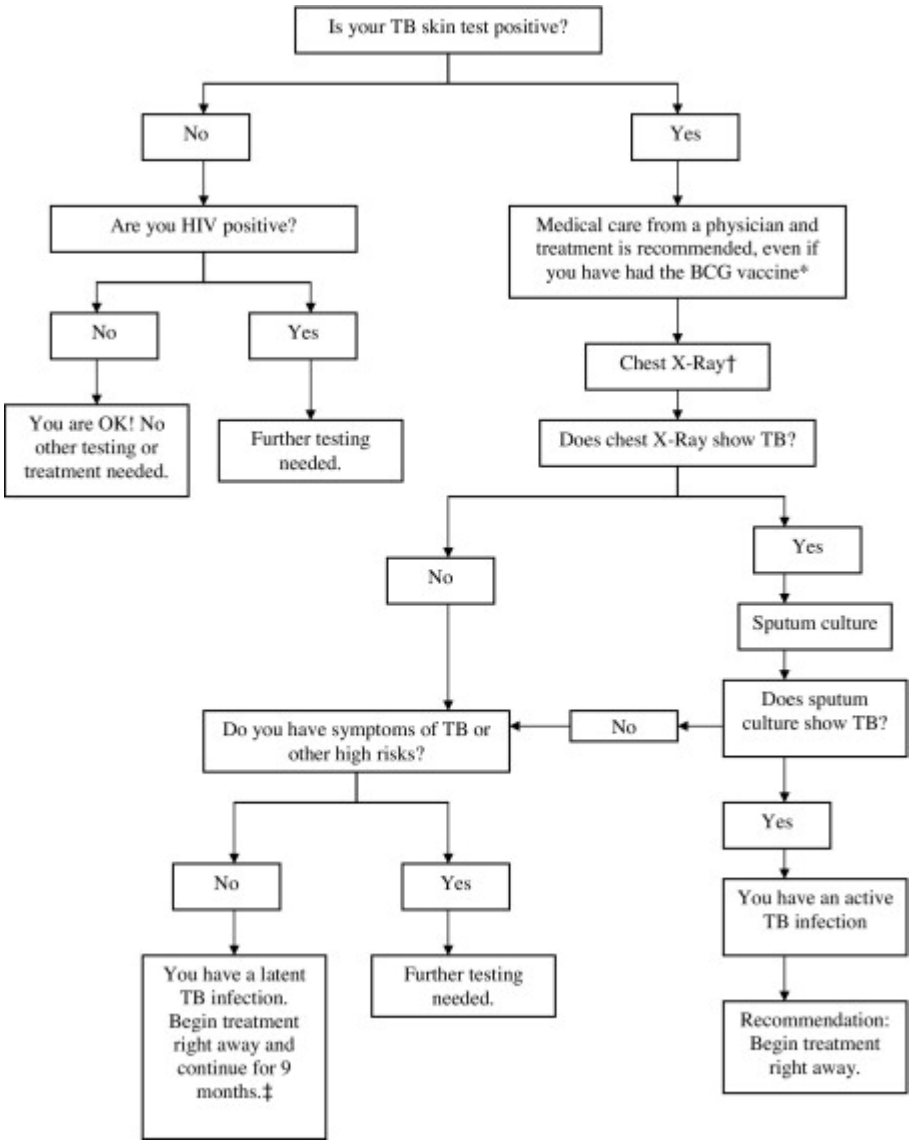
Does Everyone who Breathes in the TB Bacteria Get Sick?
No, most people do not get sick even if they become infected with TB. Some people will get latent TB. A person with latent TB has the bacteria in their body, but is not sick and cannot spread TB to others. A few people who breathe in the bacteria will become sick with TB. There is no way of knowing who will get sick and who will not.

Is There a Vaccine to Prevent TB?
In countries where TB is very common, small children may be given a vaccine to prevent severe TB. The vaccine is called Bacille Calmette-Guérin (BCG). It is not usually given in the United States.

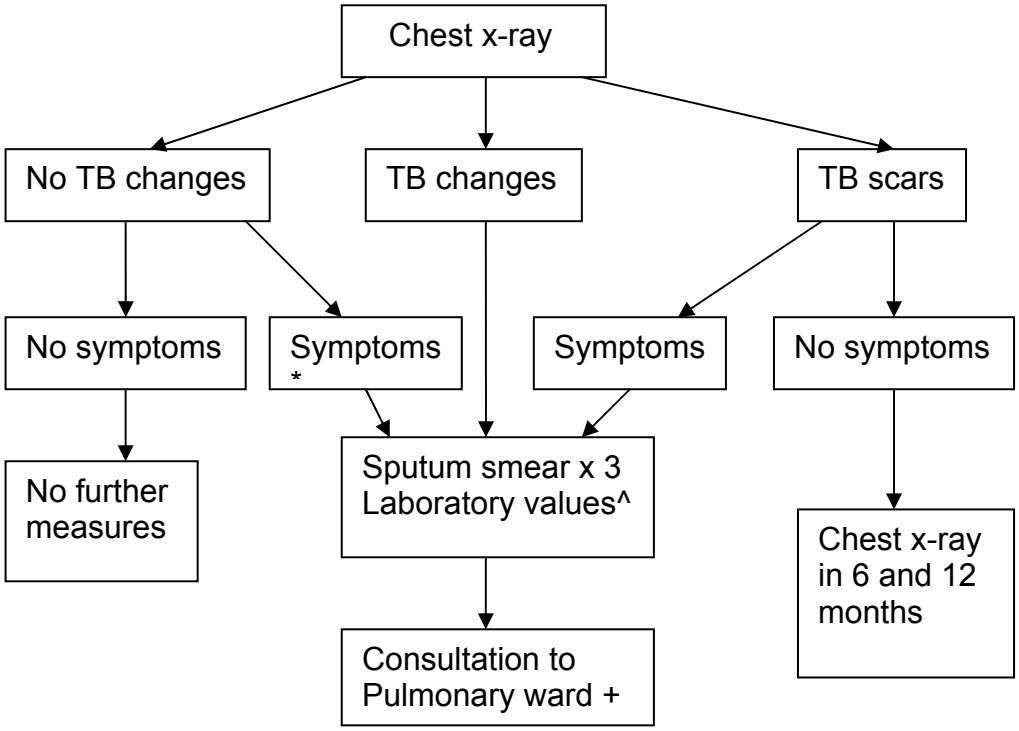
How Can I Prevent TB?
You can avoid getting TB by not having close contact or spending long periods of time around people who are sick with TB. People who are at high risk for TB should be tested and treated if they have the disease.

I Am Pregnant. Should I be Tested for TB?
TB testing is safe in pregnancy, and testing is recommended if you are in one of the following high risk groups:
- You have close contact with people who are sick with TB
- You have HIV/AIDS
- You inject illegal drugs
- You live in a high-risk place (prison, mental institution, or homeless shelter)
- You are a health care worker serving high-risk clients
- You were born in a country that has a high rate of TB and you came to the United States in the last 5 years
- Your health care provider has advised you to be tested

You can be tested even if you had the BCG vaccine (see chart on next page) when you were a child.


Is your TB skin test positive?
No
Yes
Are you HIV positive?
Medical care from a physician and treatment is recommended, even if you have had the BCG vaccine*
No
Yes
Chest X-Ray†
You are OK! No other testing or treatment needed.
Further testing needed.
Does chest X-Ray show TB?
No
Yes
Sputum culture
Do you have symptoms of TB or other high risks?
No
Does sputum culture show TB?
Yes
No
Yes
You have an active TB infection
You have a latent TB infection. Begin treatment right away and continue for 9 months.‡
Further testing needed.
Recommendation: Begin treatment right away.

APPENDIX 2. Further measures based on chest x-ray
(Rajalahti, I. &Valve, K. 2007.)



* Cough > 3 weeks, sputum smears, hemoptysis, weight loss, night sweats, dyspnea
^ PVK, La, CRP, Alat, Afos (according to Tampere University hospital)
+ Pulmonary ward KEI2 (TUH) physician

APPENDIX 3. Tuberkuloosin ilmaantuvuus sekä viljelyvarmistettujen tapausten osuus Suomessa vuosina 1995-2006 (THL 2007.)

Vuosi	Keuhkotuberkuloosi				Muu tuberkoloosi		Kaikki			
	Tapauksia	Ilmaantuvuus / 100 000	Yskösvärjäys-positiivisia tapauksia	Yskosvärjäys-positiivisten tapausten ilmaantuvuus / 100 000	Tapauksia	Ilmaantuvuus / 100 000	Tapauksia	Ilmaantuvuus / 100 000	Viljelyvarmistettuja tapauksia	Viljelyvarmistettujen osuus (%)
1995	435	8,5	243	4,8	227	4,5	662	13	472	71,3
1996	432	8,4	241	4,7	213	4,2	645	12,6	510	79,1
1997	363	7,1	188	3,7	212	4,1	575	11,2	435	75,7
1998	397	7,7	201	3,9	231	4,5	628	12,2	491	78,2
1999	382	7,4	180	3,5	183	3,5	565	11	487	86,2
2000	370	7,2	227	4,4	167	3,2	537	10,4	451	84
2001	315	6,1	158	3	178	3,4	493	9,5	411	83,4
2002	296	5,7	138	2,7	176	3,4	472	9,1	391	82,8
2003	291	5,6	148	2,8	121	2,3	412	7,9	347	84,2
2004	230	4,4	127	2,4	101	1,9	331	6,3	286	86,4
2005	263	5,0	135	2,6	98	1,9	361	6,9	316	87,5
2006	210	4,0	96	1,8	83	1,6	293	5,6	266	90,8

TAMPEREEN
AMMATTIKORKEAKOULU

TUBERCULOSIS REAWAKENING – CONSIDERATIONS IN MATERNAL WELFARE

THE BOOKLET

Emmi Hämäläinen

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1 TUBERCULOSIS

Tuberculosis (TB) is an airborne disease caused by **Mycobacterium tuberculosis** and its most common form is the pulmonary one. The symptoms are dry, non-productive cough (early stage), sputum-like or bloody cough (later stage), increased coughing, chest pains, shortness of breath, local wheezing cough, general malaise, fatigue, anorexia, weight loss, night sweats and low-grade fever. Symptom-free tuberculosis is also a possibility at an early stage.

Diagnostics include a physical examination, complete medical history, tuberculin skin test, chest x-ray, sputum smear and culture. Further examinations are carried out at a specific clinic for pulmonary diseases where the patient is referred by a physician or a gynecologist. Patient who has an acute outburst of tuberculosis is to be treated in hospital in isolation.

Tuberculosis is not especially **infectious**, only the pulmonary one is potentially infectious. Bacilli must be at least 10 000-100 000 pieces in the sputum smear**.** If only the culture is positive the risk is minimal. Efficient pharmacotherapy reduces the risk of infection and after couple of weeks person is no longer infectious.

An infectious person releases droplets by talking, coughing, sneezing and the victim inhales them. Active disease is also possible by reinfection and activation of dormant bacteria. About 10% of patients who are initially infected develop active tuberculosis. Tuberculosis is a common disease especially in the Southern and Central Africa and Eastern Europe.

Tuberculosis infection does not happen instantly and a person needs to spend a lot of time with an infected person. These people are mostly family members, colleagues or other patients. Substance abusers, homeless, poor, people with a coexisting disease (such as diabetes) and immunocompromised individuals are at a higher risk. Being a health care worker working with risk groups also exposes to the infection.

2 TUBERCULOSIS TODAY

Today tuberculosis is classified as **generally hazardous infective disease** and is treated whether the patient is compliant or not. According to Finnish law person can be admitted to hospital against his wishes for maximum of two months.

About one third of the world's population has got the TB infection and almost nine million people fall sick every year. Of the patients 95% are in the undeveloped countries. In Finland in 2006 293 new cases of TB were diagnosed of which pulmonary cases were 210. To compare to situation in 2009, the number of TB cases was 411. The majority (295) was pulmonary.

The drug-resistant TB (DR-TB) is caused by mycobacteria tuberculosis that are resistant to at least one of the basal anti-tuberculosis drugs and possibly to others but it is still not referred as the multiresistant type.
The multidrug resistant TB (MDR-TB) is caused by mycobacteria tuberculosis that are resistant to at least isoniazide and rifampin.
The extensively drug-resistant TB (XDR-TB) is life-threatening form of TB. It is caused by mycobacteria tuberculosis that are resistant to isoniazide and rifampin and to any of the fluoroquinolones and at least one of the following second line anti-TB-drugs: amikacin, kanamycin or capreomycin.

In Finland drug-resistant TB is still relatively rare. In 1998-2004 5% of all mycobacterium tuberculosis cases were drug-resistant, of which only 0,5% met the MDR-criteria.

The BCG-vaccine (Bacillus Calmette-Guérin) is developed to reduce the risk of serious tuberculosis. It does not give full protection but prevents TB from spreading in the body. The vaccine gives immunity for approximately ten years. In Finland it is not routinely given to babies anymore because of low prevalence

of tuberculosis. Since 1.9.2006, the protocol has been to vaccine only babies at the risk groups. The BCG-vaccine should not be given to individuals allergic to any of its compounds, to individuals having immunosuppressive therapy or HIV-infection. Contraindication is also fever or severe rash. Areas that have high incidence of tuberculosis, vaccinating symptomless HIV-patients is relevant.

In Finland the standard treatment for tuberculosis is isoniazide (INH) and rifampin (RMP) for six months. The third medication for the first two months is often pyrazinamide (PZA). An alternative to pyrazinamide is ethamputol (EMB). The patient takes all his medications at the same in the morning. For the patient all the medications for treating tuberculosis are free of charge in Finland.

All antituberculosis drugs have undesired side effects

Isoniazide can induce rash, fever, seizures, irritability, pins and needles - sensation and liver reactions. For pins and needles sensations vitamin B6 is given prophylactic.
Rifampin reduces the effect of certain medications (for instance warfarin) and even contraceptives loose some of their effect. Digestive problems, rash, the Flu-syndrome and dyspnea may appear. Feces, sweat, urine and even contact lenses will discolor to brownreddish.
Pyrazinamide causes joint aches, skin reactions, digestive problems, liver problems, sensitivity to light and even gout.
Ethamputol may pose a risk of optic neuritis and cause joint aches.

Before and during the medication therapy **laboratory values** (that concern blood, functions of the liver, pancreas and kidneys) are monitored on a monthly basis. Urine analysis is done as well. Chest x-ray is taken before starting the treatment, after two and six months and whenever needed. Sputum smears and

cultures are monitored regularly. The strain of TB is tested for resistance to any of the most commonly used drugs.

3 TUBERCULOSIS AND THE GYNECOLOGICAL PATIENT

A gynecological patient may suffer from **genital or urinary tuberculosis** which often are late manifestations of an earlier symptomatic or asymptomatic pulmonary TB infection. Uncontrolled diabetes, acquired immunoinsufficiency syndrome and advanced age are risks for reactivation. Pregnancy is rare in the presence of genitourinary tuberculosis and may be complicated by spontaneous abortion or ectopic pregnancy.

Primary infection of the female genital organs is most often hematogenous and rarely possible from sexual contact. Genital tuberculosis is often localized in the mucosa of the uterus and in the follicle tubes. It can be the reason behind abnormal menstruation or infertility. Nevertheless it is possible after the menopause as well. A sample of menstrual blood, dilatation and curettage-sample or laparoscopy is used for examinations.

Urinary TB is almost asymptomatic at first but later symptoms can be difficulties to urinate, nocturia and pelvic pain. Classical symptoms are aseptic pyuria, proteinuria and hematuria. A warning sign is a history of recurrent Escherichia coli infection. Urinary TB may lead to kidney failure. Urine samples of three following mornings are examined. Diagnostics include ultrasound of kidneys, CT, radiography and intravenous urography.

4 TUBERCULOSIS AND PREGNANCY

The incidence of tuberculosis in pregnancy is on the increase in the developed countries as a result of immigrants. In pregnancy the prevalence of tuberculosis is from 0.3% to 1.9%. Pregnant women exposed to infectious (sputum smear positive) Mycobacterium tuberculosis are called to a primary check-up and follow-ups to a local health center (APPENDIX 1).

A woman can have tuberculosis and then get pregnant or she may become infected during pregnancy. Pregnancy alters the immune response and tuberculosis may appear more often than with a non-pregnant person, particularly when associated with poor nutrition, immunodeficiency and/or coexisting disease.

Tuberculosis can get worse during pregnancy even leading to miscarriage. In most cases, however, pregnancy does not change the course of acute tuberculosis nor does it pose a risk for reactivation. Tuberculosis in pregnancy includes prematurity, low birth weight, miscarriage and perinatal death especially if women are diagnosed late. Intestinal, spinal, endometrial and meningeal TB is associated with an increased frequency of maternal disability, fetal growth retardation and babies with low Apgar scores.

The symptoms of tuberculosis in a pregnant woman are: cough, weight loss, fever, malaise, fatigue and hemoptysis. They are also more likely to have an asymptomatic disease. The expectant mothers in the risk groups should be targeted for screening by the safe **Mantoux test**. If it is positive, a chest x-ray should be taken.

Prevention of tuberculosis is important and regular visits to maternity clinic during pregnancy are essential. If a woman planning a pregnancy belongs to the risk group or already has the infection she should be informed about the TB and its effects on pregnancy. Should there appear any of the symptoms a mother needs to be referred to a specialist.

The four **basic drugs** to treat tuberculosis – isoniazid, rifampin, pyrazinamide and ethamputol – **are all safe to use in pregnancy** (are not teratogenic). Potentially ototoxic for the baby are streptomycin and aminoglycosides and should not be used. P-amino salicylic acid has been safe. Ethionamide and protionamide are teratogenic (inducing premature labor) and not recommended. Active tuberculosis in pregnancy must always be carefully treated. If left untreated, TB is more harmful than the drugs for both.

5 TUBERCULOSIS IN CHILDBIRTH

Pregnant woman diagnosed with TB is **followed up by maternity clinic** and the risks of infection are monitored. The childbirth is planned well and managed in isolation. If the TB diagnosis is confirmed close to delivery the medications are started but are not yet effective to prevent infecting the medical personnel or the unborn baby.

Only those women giving birth that have pulmonary tuberculosis are potentially infectious. The mother can be allowed give birth naturally after two weeks of medical therapy. A risk arises if the pregnant woman is diagnosed later than two weeks prior to birth and she is sputum smear positive. The staff and other patients use dust mist fume masks and the mother is isolated in negative pressure ventilation. The baby needs protection and later on prophylactic medication.

A route of **infection of the fetus before or during child birth** is from aspiration of infected amniotic fluid to direct contact with mycobacterium induced cervicitis or endometritis. Caesarian section can be useful in some cases if the infection is in the woman’s birth canal.

6 TUBERCULOSIS AND PUERPERIUM

Pregnant women with TB expose their fetus to the infection. Progression from infection to disease is highest in the first year. **Congenital tuberculosis** in neonates is serious but rare. Tuberculosis may infect the placenta or the female genital tract or it can be introduced hematogenously through the umbilical vein. The fetus may be infected by aspiration or indigestion of amniotic fluid contaminated by TB through placenta.

Symptoms are often non-specific and manifest within two or three weeks postnatally. First respiratory distress and hepatosplenomegaly appear and are followed by fever and lymphadenopathy. Abdominal distension, lethargy, irritability, ear discharge and skin lesions are possible as well.

Investigations require repeated specimens from different sites. The tuberculin skin test may be negative first, but in 4-6 weeks it becomes positive. Chest radiograph, blood tests, sample of cerebral-spinal fluid, sputum, CT, bronchoscopy, gastric aspirates, smears from the middle ear and bone-marrow aspirates may indicate TB. The mortality rate is nearly 50 percent due to delayed diagnosis. Tuberculosis in the neonate simulates other congenital infections such as syphilis or bacterial sepsis. The placenta should be examined and cultured for mycobacterium tuberculosis if there is any suspicion.

The concentration of anti-tuberculosis drugs in **breast milk** is not sufficient to prevent or treat the infection in the baby. Prophylactic medications are given to babies born to mothers with active TB. The first-line drugs cross into breast milk but the amounts are not significant and breastfeeding is encouraged. Medications should be taken after breastfeeding and the next feed should be from the bottle. If both are on isoniazide it is possible that the drug reaches supratherapeutic doses and then bottle feeding is advised. Supplementary vitamin B6 should be given to the baby on isoniazide or if the mother is taking this same medication because deficiency of vitamin B6 can cause seizures in the neonate.

Perinatal tuberculosis can occur from airborne infection from the mother. To protect the newborn, isolation from the mother can be considered if the outbreak is right after the birth. The baby is vaccinated and the treatment is started on both parties instantly.

In conclusion

For the future it is of great importance to be aware of TB and its co-infections. Tuberculosis has infected nearly one third of HIV patients. It has been estimated that more than two million people die each year from TB and HIV's lethal combination, both of which speed the other's process. The worst situations are in the sub-Saharan Africa.

RECOMMENDED READING:

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WHO 2004-2010 http://www.who.int/

APPENDIX 1

FOLLOW-UPS OF PREGNANT WOMEN EXPOSED TO TUBERCULOSIS
(HUS 2010)

Pregnant women exposed to infectious (sputum smear positive) Mycobacterium tuberculosis are called to a primary check-up and follow-ups to a local health center.

Primary check-up after exposure to TB

* Anamnesis
  - Symptoms of TB infection
  - Time of exposure, BCG-vaccination, prior TB infection and treatment, immunosuppressive diseases and treatment
* Clinical examination
* Chest x-ray at the first check-up
  - Symptomless pregnant women after 20th gestational week
  - Symptoms-having pregnant women disregarding gestational week.

Follow-ups routinely and in the third trimester

* Routine follow-up: Chest x-ray in 6 and 12 months after exposure to TB
* In the third trimester the chest x-ray is always taken - at least an x-ray one month prior to due date. In case the x-ray shows no indication of TB, no further measures is necessary in the hospital for the delivery. The maternity clinic always informs the hospital of the x-ray.

If any indication of TB during pregnancy

* Chest x-ray (disregarding gestational week), sputum smear and culture x3
* Consult a specialist in pulmonary diseases for further measures

The newborn is always given the BCG vaccination if belonging to a risk group.