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Antenatal care in Mursan, India

A clinical study and litterature review of current recommendations
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Abstract

Although India is a prosperous country in many ways the health system is still facing great challenges. When it comes to antenatal care India can be compared to other developing countries. In 2002 the WHO developed new guidelines for antenatal care, which are evidence based, and can be applied with minimal resources. Our objective in this study was to investigate whether or not attending antenatal controls correlated with complications during labour in Mursan. We also researched current recommendations for antenatal care in the world, and saw whether this was being followed in Mursan. We review some of the literature on the subject to see what can be done to increase the coverage of good antenatal care in the developing world. We used data from 108 deliveries registered in the Mursan clinic in 2010, and used SPSS for analysis. In addition to this, we used unsystematic searches in PubMed, and the WHO and UN web pages, to find relevant background information on the topic.

We found that more than half of the women who delivered at the clinic had not attended any antenatal check-ups at the same clinic. Among the women who had been to few antenatal visits there was a 1,68 times greater risk of complications compared to those who attended the recommended number of four or more. This reflects the importance of attending antenatal care, and suggests there is still a lot to be done to increase antenatal care coverage in rural India.

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Introduction

Maternal mortality and birth complications are still a major problem in the developing world, thus it is part of the United Nations Millennium Development Goals (MDGs) to reduce child mortality and improve maternal health (1). Antenatal follow-up is one of the cornerstones of preventive medicine, however studies have shown contradicting results as to whether antenatal care has a beneficial effect on birth outcome (2). Some authors suggest that antenatal care does not have a direct effect on birth outcome, and that the characteristics of the women who account seek antenatal care account for the differences (3,4). The World Health Organisation (WHO) has developed a model for antenatal follow-up, where it is recommended that all pregnant women attend four antenatal controls (5). Our objective was to investigate the effects of antenatal follow-up in rural India. Do antenatal visits have a beneficial effect on birth outcome?

We travelled to Mursan, India in January 2011, where we stayed at the Mission Health Centre for four weeks. Mursan is a small town in the Hatthras district in Uttar Pradesh, between Delhi and Agra. The Methodist church had three clinics in this area, in Mursan, Beswan and Karhari, where they amongst other things provide vaccinations for children and antenatal clinincs. The clinic in Mursan was closed in 2011. In addition, the staff also coordinates HIV-testing, and information in the area, and these projects are still up and running. The Mursan clinic had a DOT-center for patients with tuberculosis. The clinic in Mursan was open 24 hours a day for emergencies such as childbirth or preterm labour.

During our stay in Mursan we attended the antenatal clinic and the birth centre, and used the patient health cards for data collection. We also attended their sterilisation camp where the delivery room was transformed into an operation theatre, in which three surgeons were working simultaneously, and over 80 women received tubal ligation in one day. In addition to the antenatal clinics and the birth center, we also attended HIV-camps where health workers travelled out to the district to test people for HIV. We attended baby shows where babies and young children were weighed, and general information about nutrition was given to the parents. During our stay we saw many of the local facilities in Mursan. We saw the local government hospital, the hospital in Alligarh, and several private clinics. Out of all clinics and

hospitals we saw, we found the Mission Health Centre to be one of the health care facilities of best standard.

We were fortunate enough to collect money from family and friends during our stay in Mursan, which we used to buy wool carpets for the people living in the slums, and toys for the kindergarten. We donated the leftover money to the clinic. Unfortunately the Clinic in Mursan was closed in 2011, but a new clinic was started in July 2011, and most of their projects are still active (6).

Background

The situation in India

The population in India per July 2012 is estimated to 1,205,073,612, making India the second most populated country in the world after China (7). India alone accounts for 40% of low birth weight births in the developing world, and more than half of those in Asia (8). The maternal mortality ratio (MMR) has gone drastically down over the past years, however infant mortality ratio (IMR) and MMR still remain high, and show regional variations. Indias share of the world's global burden of disease (BoD) is 21%, and Indias share of the population in the world is 17%, which implies a BoD of several points higher than the population share. The BoD is unequally distributed over the Indian population with a bias against poor households. In addition obesity is now emerging as part of the dual burden of disease(9).

India has a large and diverse health sector. The health care services in India has a number of levels, from national to village level (10). One of the main challenges in Indian health sector is to achieve a sufficient number of human resources for health. India looses thousands of health professionals every year to migration. The distribution of staff is also a challenge as urban areas have a higher number of health workers per 1000 population than rural areas (4.2 versus 1.18 total health workers) (9).

The United Nations has developed a list of Millennium Development Goals (MDG) to be achieved by 2015. Goal 4 is to reduce child mortality, with target 5: "Reduce by two-thirds, between 1990 and 2015, the under five mortality rate" (10). In 1970 the under-five mortality rate was 202 per 1000 live birth. There was a considerable reduction of the under-five mortality rate during the 80s, however during the 90s the rate of decline was only half of that of the previous decade. At the current rate India will not be able be able to achieve the MDG goal of an under-five mortality rate of 41 per 1000 live births by 2015, but only reach 64 (10). The infant mortality rate has declined significantly over the last 40 years, from 129 per 1000 live births in the 1970s to 57 in 2005-2006. The MDG target is 27. Two-thirds of the infant mortality rate can be accounted for by neonatal mortality. Two major causes of infant mortality are prematurity and low birth weight. The WHO states that the key requirements to reduce perinatal and neonatal mortality are antenatal care, safe delivery and quality of newborn care (10).

Goal 5 of the UN's MDG is to improve maternal health through target 6: "Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio". Unfortunately there are no reliable estimates available on MMR. The Sample Registration System (SRS) estimate an MMR of 301 in 2001-2003, and these results, though they are only indicative, reflect the neglect of womens health in India (10). The MMR estimates are weaker in the north and central India, where Uttar Pradesh is located, compared to the south and the west (10).

In 2005-2006 only 52,0% of women in India had at least 3 antenatal care visits for their last birth. There is a large difference between the states. The corresponding numbers for Uttar Pradesh is 26,6%, which is the poorest in India, and 95,9 in the state of Tamil Nadu (10).

The ratio of boys to girls in the age group 0-6 years is increasing. In 1991 the ratio was 945 girls per 1000 boys, and in 2001 it had declined to 927 girls per 1000 boys. Boys are often preferred in India due to cultural, social and economic factors. In fact, there has been an increased amount of selective abortion of female foetuses, despite that Indian law forbids sex determination on ultrasound (11,12). The child-sex ratio is also influenced by a higher death rate in female children due to neglect (13). One of the causes of higher mortality in girls is that girls have higher malnutrition levels than boys (10).

India fact box

Population	1,2 billion (July 2012 est.) Country comparison to the world: 2
Age structure	0-14 years: 29.7% (male 53% female 47%) 15-64 years: 64.9% (male 52% female 48%) 65 years and over: 5.5% (male 48% female 52%) (2011 est.)
Median age	Total: 26.2 years (male: 25.6 years, female: 26.9 years) (2011 est.)
Birth rate	20.6 births/1,000 population (2012 est.) Country comparison to the world: 85
Death rate	7.43 deaths/1,000 population (July 2012 est.) Country comparison to the world: 116
Sex ratio	At birth: 1.12 male(s)/female (2012 est.) Under 15 years: 1.13 male(s)/female 15-64 years: 1.07 male(s)/female 65 years and over: 0.9 male(s)/female total population: 1.08 male(s)/female
Maternal mortality rate	230 deaths/100,000 live births (2008) Country comparison to the world: 56
Infant mortality rate	Total: 46.07 deaths/1,000 live births (2012 est.) Country comparison to the world: 50 Male: 44.71 deaths/1,000 live births, female: 47.59 deaths/1,000 live births
Life expectancy at birth	Total population: 67.14 years Country comparison to the world: 160 Male: 66.08 years, female: 68.33 years (2012 est.)
Total fertility rate	2.58 children born/woman (2012 est.) Country comparison to the world: 79
Health expenditures	2.4% of GDP (2009) Country comparison to the world: 185
Physicians density	0.599 physicians/1,000 population (2005) Country comparison to the world: 118
HIV/AIDS - adult prevalence rate	0.3% (2009 est.) Country comparison to the world: 84
Major infectious diseases	Degree of risk: high food or waterborne diseases: bacterial diarrhoea, hepatitis A and E, and typhoid fever vector borne diseases: chikungunya, dengue fever, Japanese encephalitis, and malaria animal contact disease: rabies water contact disease: leptospirosis *note:* highly pathogenic H5N1 avian influenza has been identified in this country; it poses a negligible risk with extremely rare cases possible among US citizens who have close contact with birds (2009)

(7)

WHO guidelines for antenatal care

When entering in to the new millennium in 2000, the United Nations (UN) declared its Millennium Development Goals (MDGs). The main components of this declaration is to achieve specific goals in eight target areas: an end to poverty and hunger, universal education, gender equality, child health, maternal health, to combat HIV/ AIDS, environmental sustainability, and global partnership (14). Specific goals concerning maternal health are proposed. One of these goals is to achieve universal access to reproductive health, including increasing the number of women given antenatal care, reducing the number of adolescent pregnancies, and increasing the use of contraceptives and other forms of family planning (15). Also, the UN declares to achieve, by 2015, a 75 % reduction of the maternal mortality rate (15). Reducing maternal death is definitely an achievable goal, as most maternal deaths can be avoided.

One of the main tools to achieve the goal of reducing maternal deaths is to provide skilled antenatal care in Southern Asia and sub-Saharan Africa, where giving birth is especially risky. The introduction of the WHO recommendations for antenatal care is an important part of achieving this goal.

In 2002, the World Health Organization (WHO) published a manual of recommendations for antenatal care. In this manual, the results from the Antenatal Care Randomized Trial and Multicentre Trial are presented and implemented in a new WHO model for antenatal care (5). In the randomized trial, this new model for antenatal care was compared to the standard "Western" model. The new model restricts tests, procedures and follow-ups to those that have been seen to improve the outcome of the pregnancy in terms of maternal and child health (5).

The principles for this model:

1. To use a simple form that easily identifies women with special health conditions or those at risk for developing complications.
2. This identification must be done carefully, and the women at risk of developing complications should be referred to a higher level of care when such care is available.
3. The health workers should make the women feel welcome, and opening hours should be convenient. Also, interventions and testing should be done at the women´s convenience.
4. Only purposeful and beneficial tests should be performed.

5. Tests should be performed at or in close proximity to the clinic, and if necessary, interventions should be initiated the same day (5).

The WHO model of antenatal care is based on a systematic trial performed in 53 clinics in Argentina, Cuba, Saudi Arabia and Thailand. The clinics were randomly assigned to provide either the new WHO model or the standard model of care currently in use (5). The trial was performed in 1996-1998 and included 24 678 women.

In the standard model that was currently in use at the clinics, the women would have about 12 visits to the clinics, once a month the first six months, then once every 2-3 weeks the next two months, then once a week until delivery. The women were screened with urine samples (proteinuria and infection) and blood tests (syphilis, haemoglobin and blood typing) (5).
In the clinics assigned to use the WHO model, women were evaluated on the first visit to see if they required special care at more advanced clinics. As mentioned above, the new WHO antenatal care model focus on identifying those at risk for complications and only using interventions that are known to be beneficial (5).

The women in the WHO group attended a median of five visits, while the women in the control group attended a median of eight visits. The results from the randomized trial show that slightly more women in the new WHO model group were referred to a higher level of care, 13,4 % vs. 7,3 %. The rates of low birth weight, severe postpartum anaemia and urinary tract infections were similar in the two groups. Pre-eclampsia was slightly more frequent in the WHO group, while pregnancy-induced hypertension was most frequent in the standard model group (5).

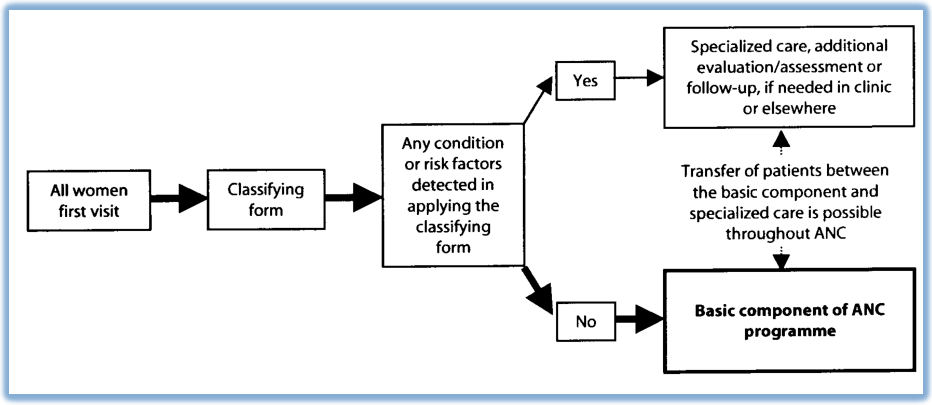

Figure 1: Structure of the WHO Antenatal Care programme

Overview of the WHO model for antenatal care:

First visit	Second visit	Third visit (add to second visit)	Fourth visit (add to second and third visit)
Classifying form to identify those at risk for complications. (appendix)	Clinical examination for anaemia	Haemoglobin test	Detection of breech presentation and referral
Clinical examination	Obstetric exam: gestational age, uterine height, foetal heart rate	Tetanus shot (second dose)	Complete ANC card (should be brought to hospital)
Hb test if clinically severe anaemia	Blood pressure	Delivery plan	
Obstetric examination: gestational age, uterine height	Maternal weight (if low at first visit)	Recommendations for lactation and contraception	
Gynaecological examination	Urine test for protein (nullipara or previous pre-eclampsia)		
Blood pressure	Iron and Folic acid supplementation		
Maternal weight/ height	Recommendations for emergencies		
Syphilis test, other symptomatic STIs	Complete antenatal card		
Urine test			
Blood type and Rh status			
Tetanus shot			
Iron and Folic acid supplementation			
Recommendations for emergencies			
Complete antenatal card			

There are still huge poor-rich inequalities in maternity care, and some state that the progress towards reaching the MDGs has been too slow (16). In their comparison of the use of health services in developing countries, Houweling et.al found that the poor-rich inequalities in the use of professional delivery care is far greater than the use of antenatal services (17). Their research included 45 developing countries, among them India, our target of study.

In India, more than 90 % of the women in the richest of the five wealth groups attended two or more antenatal visits, whilst only 1/3 of the women in the poorest of the five groups. Concerning professional delivery care, about 80 % of the richest, and only 12 % of the poorest had a professional birth attendant present at the time of delivery (17).

These figures show that focusing on antenatal care is not enough; an effort must be made to educate rural birth attendants, and also motivate women to call for professional attendance during labour. The latter can be done during antenatal visits, and one aim of the WHO model for antenatal care is to seek out those who are most in need of professional follow-up.

Antenatal Care in Mursan

The Methodist church privately funds the Methodist Public Rural Health Center (MPRHC), and their primary source of funds is NORAD (18). Antenatal care has been one of the primary activities of the Methodist Rural Public Health Programme (18).

All patients at the Mission Health Centre are filed in a cardex system. Each patient has its own set of cards where the doctors and nurses can write notes about symptoms, signs and management. The cards are bound together with string and stored in the Health Centre archive for future use. The cards are arranged alphabetically and by year, and for outsiders it can be difficult to understand how one can keep all these cards organised. One can only imagine how the efficiency would improve if they had a computer system to store all their files.

In January 2009 The MPRHC received an ultrasound scanner for use in the antenatal clinic (6). Women then had the possibility to receive ultrasound scans in their own village, instead of having to travel to the nearest city.

Routine antenatal care at the MPRHC:

According to dr Rainer Masih, the doctor who worked at the MPRHC during our stay in Mursan, it is advised that women at the MPRHC attend a minimum of three antenatal controls. At every antenatal visit it is routine to measure blood pressure and monitor weight.

For first trimester antenatal visits internal examination is not recommended, unless it is required. Routine blood investigations during the first trimester consist of haemoglobin, blood sugar level, VDRL, hepatitis, HIV. An ultrasound examination is performed at 5-6 weeks of gestation to check foetal heart rate (FHR).

During the second trimester no internal examination is performed. Physical examination consists of auscultating the FHR. Haemoglobin is measured again, and urine investigations are performed. At 16-20 weeks of gestation and ultrasound examination is performed.

At the third trimester anenatal visit the FHR is auscultated. Ultrasound is repeated at 34-36 weeks of gestation to examine the status of the foetus, placenta position and cord status. An internal examination is performed to check cervical status (19).

For comparison: Antenatal care in Norway

In Norway, the recommended number of antenatal visits is eight visits through week 40, the first somewhere between week 8 and 12, the next is the routine ultrasound screening around week 18, then in weeks 24, 28, 32, 36, 38 and 40 (20). In the national recommendations for antenatal care published in 2005, the new WHO model is taken in consideration, and the Norwegian recommendations are based on a review of the WHO recommendations. Although the WHO recommends a lower number of check-ups, the Norwegian Directorate for Health and Social affairs argues that the frequent check-ups in the end of the pregnancy are important for diagnosing pre-eclampsia, and that the WHO recommendations of only four visits is too distant from the Norwegian tradition of weekly controls. A Cochrane review showed that a reduction in the number of antenatal care visits would not lead to an increase in adverse biological maternal and perinatal outcomes, however the women's satisfaction could be reduced (21).

The content of the controls is pretty much universal, with a few limitations concerning the accessibility of equipment. In Norway, the first antenatal control comprise of information and counselling related to lifestyle, economy, screening and the antenatal care program, identifying those in need of closer monitoring, information about blood typing, Hb screening, HIV and Syphilis screening, urine sampling, weight and blood pressure, and further testing for infectious disease or STI´s if indicated. The next controls consists of information and clinical examination with blood pressure, urine sample, weight, SF-measurement, fetal heart rate, Hb, antibody screening if Rh neg, and fetal position (20).

How to increase the number of antenatal visits among women in developed countries

Good antenatal care is critical for both mother and child health. It is important as to identify those at risk for complications in pregnancy and at delivery, and to give information about neonatal care, lactation, immunization and hygiene. Antenatal care is also important for determining the delivery situation. In 2000, Vanneste and co-workers found that the women who had at least one antenatal visit were four times more likely to have a skilled birth attendant present at the time of delivery (22).

Several different strategies are proposed to increase the use of skilled antenatal care among women in developing countries. There is a variable use of maternal health sevices in developing countries, and in order to increase the use of maternal health services, context-specific causes of variable use of maternal health care must be addressed (23). Availability is an important factor, cost is another. In an article in the Lancet, Schiffman et. al. analyze the results of different studies of neonatal health interventions (24). These interventions are categorized in three categories, Outreach, Family-Community Care, and Facility-based Clinical Care. When analyzing the data from nine studies, they found that Family-Community care generally had a greater potential impact on neonatal health than Outreach services, at similar costs.

Outreach antenatal care

One possible intervention in the cause to increase the number of women receiving professional antenatal and delivery care, is to seek out the pregnant women at home in their villages. In Mursan, India, we wanted to try out this low threshold programme, but we were

not able to see it through. The idea was to travel to the small villages around Mursan, and ask around for pregnant women and offer them an antenatal check-up at home. We would bring equipment for weighing, blood pressure measurements, detection of foetal heart rate and some blood tests, for example rapid HIV test. This would also be an opportunity to provide the women with information about delivery, emergency signs, lactation and contraception. Similar projects are previously attempted in different places of the world. Brooks-Gunn et. al. (1989) describes the process of locating dis-advantaged pregnant women in Harlem, New York who did not receive the recommended antenatal care (25,26). In this study three full-time community residents were paid on commission to locate pregnant women in the community, not already enrolled in the antenatal care program. The paid community residents used different tactics to locate the women. Door-to-door canvassing (14 % of the time), informal street talk (16 %) and clinic settings like welfare offices (20 %) were where most of the time was spent. Other locations were day care centres, schools, fast food chains and stores. They also used flyers and posters to recruit pregnant women.

Purpose of our study

We wanted to investigate whether or not attending antenatal controls correlated with complications during labour in Mursan. We also wanted to research the status on recommendations for antenatal care in the world, and see whether this was being followed in Mursan. In addition to this, we review some of the literature on the subject to see what can be done to increase the coverage of good antenatal care in the developing world.

Objectives:

I. Does having attended four or more antenatal check-ups predict a lower risk of birth complications among the women giving birth in Mursan?
II. What are the current recommendations for antenatal check-ups in the world, and how are they compared to antenatal care in Mursan and Norway?
III. What does good antenatal care imply for global health and how to increase the coverage of antenatal care worldwide?

Methods and material

Material

Our data is based on a systematic review of the Mursan ”delivery book” from 2010. The delivery book includes data from all the child births at the Mursan clinic each year. The information in this book includes; birth date, name of mother, sex, weight, length of the baby, number of the mothers health card, number of the babys health card, if there were complications to the delivery, who was in charge of the delivery, and who assisted in the delivery.

We used the information in the delivery book to find the mothers medical records (health card). From the health card we could extrapolate how many times she had been to antenatal check-ups at the clinic, at what time in the pregnancy and if she had had an ultrasound examination. It was difficult to systematically find any other information from the cards, as they were written by hand, and occasionally difficult to interpret. The cards were sometimes written in hindi, and we had no access to an interpreter. Our findings are also based on observations of the antenatal check-up routines in Mursan. We also observed and assisted in a number of childbirths during the stay in Mursan.

In addition to analysing the data from the delivery book, we wanted to do a project of outreach antenatal visits, to see if that could increase the number of women attending antenatal check-ups. The plan was to bring simple equipment like tape measure, to measure the fundal height, doppler to determine the foetal sound, weight, blood pressure, and alternatively also blood sampling equipment, and ask around in the small villages for pregnant women. After examining the women we would give information and encourage them to continue with check ups or seek a skilled birth attendant for their delivery.
Unfortunately, we were not able to conduct this project, partly because of shortage of time, partly because of organizational problems. Instead we will write about the research on outreach programmes and give recommendations for the implementation of such programmes in the future.

The references in this article are based on unsystematic searches in PubMed. The terms we have used are ”antenatal”, “check-ups”, “follow-up”, “control”, “india”, ”outreach”, ”gudelines”, “maternal mortality” “sex ratio” and “India”. We also gathered some data

directly from the offcial web pages of the United Nations, the World Health Organization, the CIA world factbook, and the Methodist Public Rural Health Program website. In addition to this, some information comes directly from Reidun Refsdal, midwife director at the MPRHP, Rainer Masih, doctor at the MPRHP, and from our own experiences in Mursan.

Methods

For descriptive statistics, we used IBM SPSS version 19. We converted our data from a Microsoft Excel file into SPSS, and generated descriptive statistics tables and figures from this.

Variables

The number of visits was categorized in three categories for further analysis:

- No visits – Category "0" in SPSS
- 1-3 visits – Category "1" in SPSS
- More than 4 visits – Category "2" in SPSS

The delivery complications consist of two groups combined, "birth weight" and "complications", which together became the variable "fullcomp" in SPSS.

Birth weight

- Very low birth weight (<1500 grams) – Category "1"
- Low birth weight (1501-2500 grams) – Category "2"
- Normal birth weight (>2501 grams) – Category "3"

Complications

- No complications – Category "0"
- Complications (breech position, premature, still birth) – Category "1"

Complications combined (weight and complications) – The variable "Fullcomp"

- No complications – Category "0"
- Very low birth weight + complications – Category "1"

We regarded the data from the delivery book as a retrospective cohort, where one group is the women who attended several antenatal visits, and one group is the women who never attended antenatal check-ups prior to delivery at the clinic. Classical statistical analyses may not be used on this type of study design, but the relative risk can tell us something about the risk for an event occurring in one group compared to another relative to exposure. In our case, the exposure is antenatal control, and the event is complications (disease) and no complications (no disease).

	Complications	**No complications**
No antenatal controls	a	b
Antenatal controls	c	d

The relative risk is determined by this formula:

$$RR = \frac{\frac{a}{a+b}}{\frac{c}{c+d}}$$

Sources of error

In our study, there are many sources of error to mention. As to the data gathering, there are some sources of error to be pointed at. The handwriting on the health card was sometimes very difficult to read, and a few times written in Hindi, which we could not understand. The handwriting in the delivery book was also difficult to interpret at times. Some of the health cards were not located, which meant that we had no information about previous visits for some of the women. There was also the problem that we could not be sure that all the relevant information was included on the health card.

The analysis is also based on an assumption that these women have not been to antenatal controls in other clinics, and that they deliver at term. In addition to delivery complications, we used the birth weight as a determinant of the babies' health. Unfortunately, the weightings that were done in the Mursan clinic were not very accurate, and a very large number of the babies weighed 2500 grams.

Results

All together we studied the medical records of 108 women who delivered in the Mursan Health Centre in 2010.

Age and parity

Fig. 2 shows the age distribution of the women. The age of the women in this study range from 18 to 40 years.

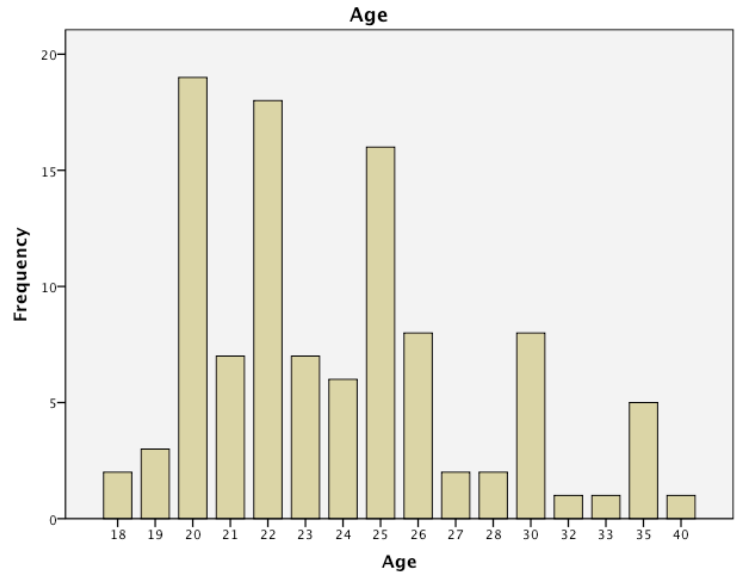

Figure 2 – Number of women of different ages in our study population

Table 4 shows that the mean age for primiparas giving birth in the Mursan clinic is 21.08 years while the mean age of those delivering their 2nd baby is 23.88 and 3rd baby is 26.35. This means that the spacing between the children is 2-3 years. The mean age for the women in our study is 24.14 years.

Table 4 – Mean age for different parities in our study population

Para	Mean	N	Std. Deviation
0	21.08	39	1.979
1	23.88	34	2.508
2	26.35	23	3.785
3	30.60	5	6.066
4	30.50	2	6.364
5	35.00	1	.
6	35.00	2	.000
Total	24.14	106	4.346

As seen in figure 3, 38 % of the women gave birth to their first child. Very few delivered their 4th child or more.

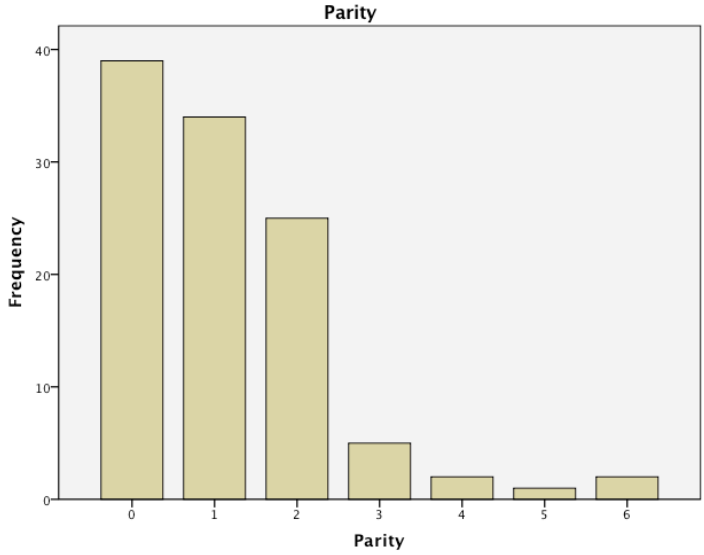

Figure 3 – Number of women of different parities in the Mursan clinic

Sex of the babies born in Mursan

Fig. 4 shows that in our study population, the frequency of baby boys was higher than the frequency of baby girls.

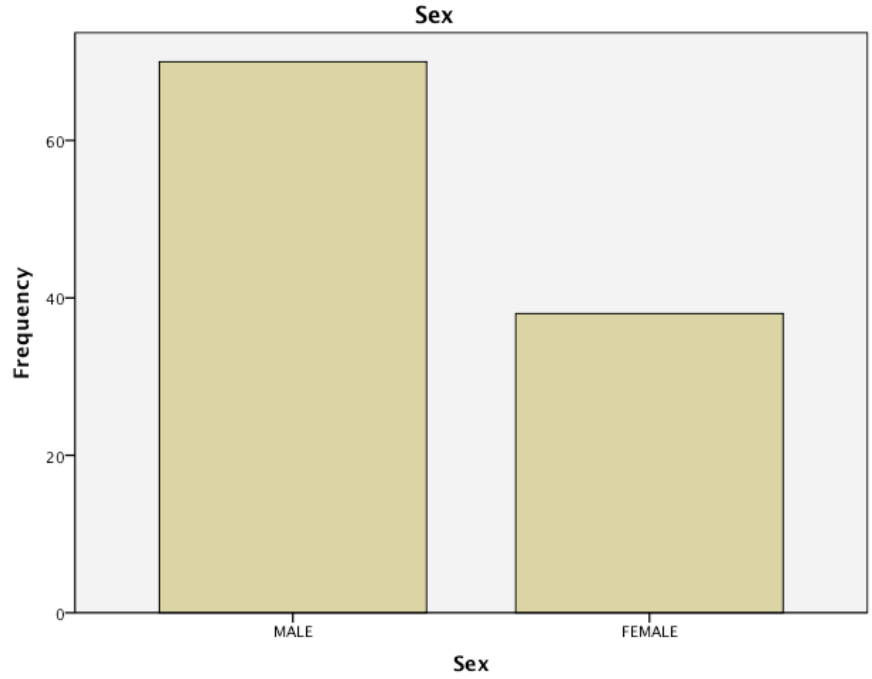

Figure 4 – Number of children of each sex among babies born in Mursan in 2010

We performed a Chi Square test that compared the sex ratio in Mursan to the ratio of baby boys versus girls reported in the 2006 article in the Lancet by Jha et al. (27) which showed 899 females to 1000 males. (These numbers are based on data from the Sample Registration System in 1997). The Chi Square is 6,052 and the test is significant at the 0,05 level (0,014) which means that significantly more boys were born in the Mursan clinic than girls.

Table 5 – Males and females in our study and the expected number of males and females

	Observed N	Expected N	Residual
MALE	70	57,2	12,8
FEMALE	38	50,8	-12,8
Total	108		

Number of antenatal visits

Figure 5 shows the number of women who attended the antenatal clinic prior to delivery. As seen, more than half (56 of 108) did not visit the antenatal clinic before they gave birth.

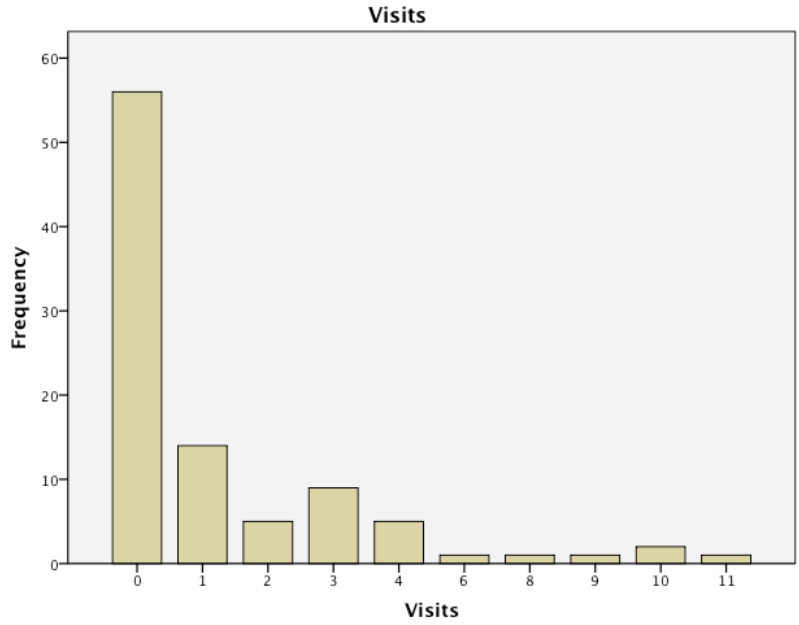

Figure 5 – Number of women having different number of visits during pregnancy

It was a tendency that primiparous women had more visits than multiparous, but not significant ($p > 0.05$).

Table 6 – Primi- or multiparity in the different visits groups

		No visits	1-3 visits	> 4 visits	Total
Primiparous	Count	17	12	10	39
	%	43,6 %	30,8 %	25,6 %	100 %
Multiparous	Count	39	16	14	69
	%	56,5 %	23,2 %	20,3 %	100 %
Total	Count	56	28	24	108
	%	51,9 %	25,9 %	22,2 %	100 %

Table 7 shows the percentages of women in the different categories of visits and the sex of the baby they delivered. The Pearson Chi-Square test performed shows no difference between the sexes in the three antenatal controls groups ($p > 0.05$).

Table 7 – Category of antenatal visits and the sex of the baby

		No visits	1-3 visits	> 4 visits	Total
Male	Count	36	17	17	70
	% within sex	51,4 %	24,3 %	24,3 %	100 %
	% of total	33,3 %	15,7 %	15,7 %	64,8 %
Female	Count	20	11	7	38
	% within sex	52,6 %	28,9 %	18,4 %	100 %
	% of total	18,5 %	10,2 %	6,5 %	35,2 %

Complications

Figure 6 shows the number of "no complications" and "complications" when the women are divided into subgroups according to the number of antenatal visits they have been to.

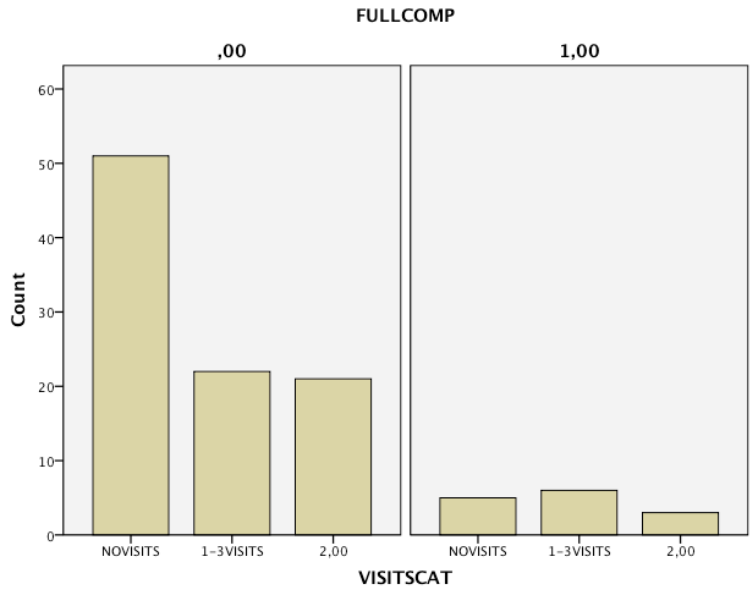

Figure 6 – Frequency of no complications vs. complications in the different visits categories (the diagram captioned ,00 displays the group with no complications, 1,00 is the group with complications)

Figure 7 shows the calculation of the relative risk according to the formula described in the "Methods" chapter. The calculated incidence of complications in the group of women who attended 1-3 antenatal visits was 0.21, while the incidence of complications in the group of women who attended four or more visits was 0.125. This imply a relative risk of 1.68.

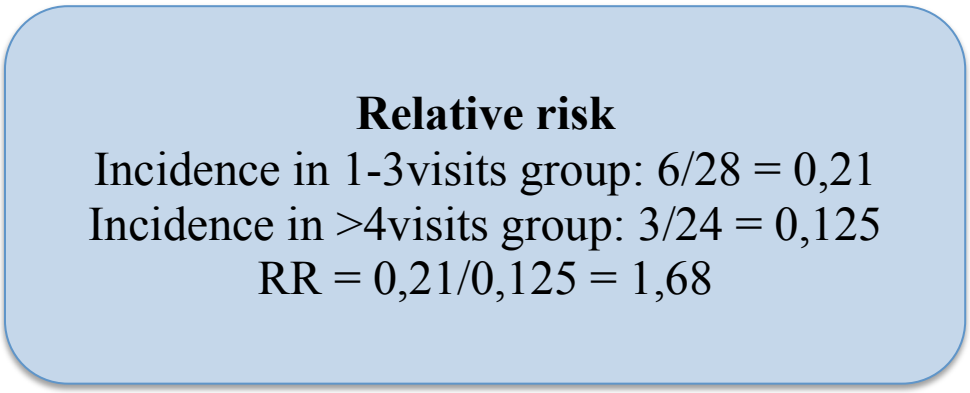

Figure 7 – Calculation of the relative risk of complications in two subgroups

Table 8 shows the number of complications among the women in the different subgroups of antenatal visits. The percentage of complications was highest in the group of women who attended between one and three antenatal controls, 42,9 % compared to 35,7 % among those who did not attend any controls, and 21,4 % among those who attended four or more controls, but not significant (p >0.05).

Table 8 – Frequency of complications in the different subgroups of antenatal visits

	No complications	Complications	Total
No visits	51	5	56
	54,3 %	35,7 %	51,9 %
1-3 visits	22	6	28
	23,4 %	42,9 %	25,9 %
> 4 visits	21	3	24
	22,3 %	21,4 %	22,2 %
Total	94	14	108

Discussion

Initially, we wanted to analyse the data on the Mursan deliveries, with consideration to whether the outcome (complications, birth weight) was better among the women who attended antenatal controls compared to those who did not attend or only attended a few such controls. Unfortunately, as the design of the study is a retrospective cohort, and we were only able to collect data from 108 deliveries it was not suitable for such analysis, therefore we were not able to get any statistically significant results of that concern from this material. Our data was added to SPSS, and although we could not use traditional statistics on our material, some descriptive statistics were extracted.

Antenatal care in India and Mursan

As mentioned earlier, very few women attend antenatal clinics in India, and there is a large difference between the poor and the richer states. The main problem seems to be to provide sufficient funds to the poorest states. In the media there has been implied a certain amount of corruption, especially in Uttar Pradesh(28), which is the poorest state in India.

After attending a few antenatal clinics in Mursan our general impression of the clinic was good. Knowing Mursan is a very rural area of the poor state of Uttar Pradesh, our expectations were quite low, and we were impressed to see how well the clinic worked. At first it seemed a bit unorganized, with patients, relatives and staff walking freely around from room to room, and no computer system for writing patient notes. Clearly the rules of doctor patient confidentiality were not as strict as we are used to from Norway. But in the end patients were able to speak to the doctor and be examined, and the hand written notes were stored in a cardex system, where, incredibly enough, most of the notes were possible to be retrieved.

When it comes to antenatal care, it is a bit unclear to us what model they follow at the MPRHC, but all together it seems quite similar to the WHO and the Norwegian model. At least most of the routine examinations are the same.

Antenatal care in the world

The main challenge for antenatal care throughout the world is still that far from all women has good antenatal care available. The WHO antenatal care randomized trial has shown that very few resources are required to offer good, safe and evidence-based antenatal care.

The content of the controls is in essence the same throughout the world, although the importance of some routine tests may wary. For example, in Norway, screening for HIV and Syphilis seldom lead to positive tests and initiation of treatment, but in Mursan and other parts of the developing world, these tests more often have great consequences for both the mother and her child. Also, in Norway, weight monitoring in pregnant women is mostly concerned with identifying those with a high BMI and obesity to prevent complications such as intrauterine death (29) and hypertension (30). While in the developing world, *low* maternal weight is the problem, and weighing of pregnant women is important to prevent underweight women and the foetal complications that may lead to.

Results

It is well known that there is a strong correlation between maternal age and frequency of pregnancy related- and birth complications. Newborns of Norwegian mothers above the age of 40 have a relative risk for perinatal death of about 2,0, compared to children of mothers aged 25-29 years.(31) In our study population the mean age for primiparous women is 21,08 years. The mean age at first birth in India in 2003 was 20 years.(32) In comparison, the mean age for primiparous women in Norway in 2011 was 28,4.(33) This implies that high age is not a major risk factor amongst the women in our study population. However women under the age of 20 have an increased risk of preterm labour.(34)

Parity is another risk factor for complications in pregnancy and delivery. Both high and low parity increases the risk of complications. Particularly primiparous women above the age of 35 have an increased risk of preterm labour.(34) Regarding high parity, it has been shown that child number four has nearly twice the risk of perinatal death compared to child number two.(31) In our study population, most of the women were para 0, 1 or 2. This reflects the fertility rate in India, where the estimated fertility rate for 2012 is 2,58 children per woman.(7) This may also reflect that women in the Mursan region are frequently offered free

sterilisation at the MPRHC, and the fact that having at least two live children is a criterion for undergoing sterilisation at the MPRHC.

One would think that primiparous women attended antenatal care more to a higher degree than multiparous women. This is according to current recommendations; primiparous women generally have a greater risk of complications compared to multiparous women. Another reason for this could simply be the fact that primiparous women in India have no children at home, and thus have more time to attend controls and take care of their own health. We wanted to see if there was a difference between the two groups primipara and multipara when it came to attending no controls, few controls, and four or more controls. Only 43,6 % of the primiparous attended no controls compared to 56,5 % of the multiparous. And while 25,6 % of the primiparous attended four or more controls, only 20,3 % of the multiparous attended the recommended number of controls. As one can see, there is a difference between the groups, but this difference is not significant.

Most of the women in our study population did not attend any antenatal visits prior to delivery at the clinic. This reflects the low number of women seeking antenatal care in Uttar Pradesh, as previously mentioned. Very few women have attended more than four antenatal visits. Because the group of women fulfilling the WHO criteria of four antenatal visits is so small compared to the rest of our study population, it was difficult to compare the two groups. Fortunately, the incidence of complications was relatively low, but this contributed to making it difficult to interpret our results.

When comparing the incidence of complications in the “1-3 visits”-group to the incidence in the “four or more visits”-group we found a relative risk (RR) of 1,68. This can be interpreted as a 68% higher risk of complications for the women who only attended 1 – 3 visits compared to those who attended four or more, like the WHO recommends. In this analysis we have excluded the large group of women who did not attend any antenatal visits at all because. The reason for this is that with the two other groups we can assume that they only went to antenatal clinic in Mursan, while in the “no visits”-group it is more likely that some of them might have attended antenatal visits elsewhere.

It is also interesting to notice that the frequency of male new-borns is higher than female new-borns in our study population. When performing a Chi Square test on the ratio of baby girls

versus baby boys born in Mursan in 2010 using the ratio presented in the article by Jha et al from 2006 for comparison, we find that the sex ratio in Mursan is significantly greater than expected. The ratio in Mursan was 64,8 % boys vs. 35,2 % girls, while the expected percentages would be 52,7 % boys vs. 46,3 % girls.

This was not expected, and we find it difficult to explain, but previous studies have shown similar results (27). Female infants have a higher mortality rate than male infants in India. (see table 1)(7) This may be because the Indian culture tends to favour male infants. In a comment in the Lancet in 2006, Shirish S. Sheth writes that having a daughter is "…socially and emotionally accepted if there is a son, but a daughter's arrival is often unwelcome if the couple already have a daughter" (35). This is explained by the fact that a daughter represents a financial expense in the cost of her dowry, and when she is married, she will only benefit her in-laws, and if she remains unmarried, she is considered a burden to her parents. A son, on the other hand, works and brings in the money, and raises his family in the family home and takes care of his parents when they grow old (35). A son can therefore be compared to social security for the parents.

We witnessed this at the MPRHC when attending births. There was a remarkable difference in enthusiasm and excitement, both for the parents, the in-laws and the health workers, when a male baby was born compared to a female. One could imagine that women carrying a male foetus would be more concerned with their health and therefore tend to give birth at clinics more often, , but when analysing our data as to whether the women delivering a baby boy attended antenatal controls more often than those delivering a girl, we found no significant differences. (See table 8 in "Results").

In 1995 the UN reported of 50 million missing females in India (36). The reasons for this were suggested to be female foeticide together with better food and health care for boys and maternal death at child birth. As mentioned earlier, pre natal sex determination is illegal by law in India, and thus the women are supposed to be unaware of the sex of their foetus. Still there is an increasing amount of abortions of female foetuses. Jha et al. estimates around 10 million female foeticides in India over the previous two decades (27). However, this is mainly in the wealthier portion of Indian society, who can afford to obtain this type of information (11). It would be difficult to suggest that this would be the case in our study population.

A Norwegian study published in 2010 found a significantly low female-to-male sex ratio (65 females to 100 males) among live births in mothers of Indian and Pakistani origin in Norway giving birth to their third or fourth child. (37) The researchers suggest that this may be due to sex selective abortion. This compares to the article by Jha et al, which concluded female foeticide seems to be the main reason for this difference (27). In the correspondence following the publication of the article by Jha et al., renown Indian demographer Mari Bhat argues that the number of "missing girls" in India may not be as high as 10 million as described in the article, but what is clear is that there is a higher ratio of new born boys in India which can only be explained by sex selective abortion. As one can see, this is not only a trend in India, but also a trend among Indians living abroad.

Limiations

Internal validity

There are several limitations to our study. One limitation includes the difficulty of locating all the health cards of the women and their newborn babies. Some cards could not be located. These women were not included in the study population. In addition we had trouble reading the hand writing in some of the cards. Most cards were written in English, but some cards were written in Hindi. We did not have complete medical redcords for all the women who gave birth at the Mursan clinic.

Inaccurate measurement of birth weight is another source of error. Out of 102 newborn babies 26 weighed exactly 2500g and 22 weighed 3000g. It seems as though most of the numbers are rounded to the nearest 500g. Only a few are rounded to the nearest 100g or 10g, and only one newborn has an exact measurement with a birth weight of 1514g.

External validity

One of the main limitations to our study is that we had an inadequate number of individuals in our study population. Very few of the newborns had low birth weight, and therefore the number of "complications" was relatively low. A larger study population might have been necessary to reveal a link between not attending antenatal clinics and low birth weight in the newborn.

A major systematic limitation to the study is that we only used the birth weight of the child, and whether there had been any birth complications, as a measure of the outcome. Many larger studies include maternal health as a measure of outcome. In our case this information was impossible to retrieve from our very limited source of data.

It would also have been interesting to see the development of the child the first few days after birth. However, women who give birth at the MPRHC tend to leave soon after birth.

One confounder that might have affected the results is that women with an increased risk of birth complications, or women that need a caesarean section can not give birth at the MPRHC, but have to go to a larger public hospital. The MPRHC does not have the means, the capacity or the trained staff to perform caesarean sections.

Conclusion

Based on our investigations of frequency of antenatal control attendance in rural India we find that more than half of the women who delivered at the clinic did not attend any antenatal check-ups at the same clinic. This reflects the statistics of antenatal attendance in rural India provided by the WHO. We also find that the risk of complications, in the form of low birth weight, prematurity and stillbirths, is 1,68 times greater among the women who attended few antenatal check-ups compared to those who attended the recommended number of four or more.

Interestingly, in our study population, the ratio of male versus female babies is significantly greater than expected, and even higher than what is reported in previous studies. This highly implies an awareness of the foetal sex, which is supposed to be forbidden by law in India. One can assume that this might reflect that also among the poor people in Mursan, sex selective abortions are being performed, as it does not seem to be explained only by increased health awareness (in terms of more frequent antenatal controls), and therefore delivering in a clinic, when carrying a male baby. How the mothers have become aware of their foetus' sex is still an unanswered question. One might assume that they seek out other clinics to access this information, but we have no evidence for this, and it will remain a speculation.

The challenge when it comes to mother and child health in general, and to providing antenatal care especially, is still to reach out to the whole population. The outreach projects and community-based clinics are only small islands in the great ocean of people whom don't receive sufficient medical care. The WHO antenatal care randomized trial has given all the tools needed to provide good antenatal care to all the women of the world, but the challenge is still to reach out to the women, and to cross the cultural barriers that prevent many from seeking professional assistance in relation to pregnancy and birth.

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