

# Relation between Prenatal care and Pregnancy Outcome at Benghazi

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## Abstract

The aim of the study is to find out the relation between prenatal care (PNC) and pregnancy outcome. Other factors affecting pregnancy outcome of the mothers delivered at El-Jamahiriya hospital (parity, education, maternal age).

**Subjects and Method:** A retrospective cohort study of women who delivered at Al-Jamahiriya hospital was used. It included all delivered women admitted to the post -natal and post- operative wards at the hospital in 2007. The sample size was 300 delivered women. Interview questionnaires were used to collect data and PNC record.

**Results:** The study found that 47.3% of the mothers were aged 20-29, and 66.7% married at 20-29 years. About 94% of mothers attending PNC clinic; 73% of them at or before 16 weeks of gestation, 46.3% have 8 or more visits. We concluded that inadequate prenatal care has negative impacts on the mother and child's health. The present study reported that the fetal outcome was significantly related to socio-economic status. The prenatal care was related significantly to the husband's occupation ( $\chi^2_8=39.3$   $P=0.001$ ). Also maternal work significantly related to baby's status at birth where  $\chi^2_4=36.7$  &  $P=.001$ . Parent education is significantly related to fetal outcome where,  $\chi^2_{8=15.1}$  &  $P=0.04$  and  $\chi^2_{8=15.9}$   $P=0.04$  for maternal and paternal education respectively. Also the parity was significantly related to delivery of healthy baby where  $\chi^2_2=38.3$  and  $P=0.001$ .

**Key words:** PNC; Prenatal care

## INTRODUCTION

Women and children in developing countries are dying from simple preventable conditions. But what impact can the procedure collectively called antenatal care (PNC) have to decrease child and maternal morbidity and mortality. WHO estimated that more than 500,000 mothers die each year because of pregnancy and related complications. It was found that about 88% to 98% of all maternal deaths could be avoided by proper handling during pregnancy and labour [1,2,3,4,5].

Moreover, seven million of perinatal deaths in the developing countries were due to maternal health problems. Four million were stillbirth and three million were early neonatal deaths [1,4,5,6]. Adequate prenatal care was recognized as an important factor in the reduction of maternal and

newborn deaths [5,7,8]. So the purpose of prenatal care is to decrease the number of infants born too soon (preterm birth), too small (low birth weight) and to prevent mother and infant sickness and death [1,4,5,6]. Prenatal period represents the most important time to reach pregnant women. There are a number of interventions that may be vital to their health and infants' well being. The concept of PNC: Many of the practices carried out during PNC improve the wellbeing of the mother and/or the baby and decrease the burden of adverse perinatal outcome. WHO has developed specific guidelines regarding the timing and content of PNC visits [5]. Development of PNC from the beginning of 20th century and its relation to perinatal mortality (PNM) in developing countries is presented: In west and middle European countries the introduction of PNC 1920-1970 resulted in a decline in the perinatal mortality rate. Outcome of pregnancy; means what happens

to the product of conception during pregnancy, labour, neonatal and postnatal period. It is classified into favorable and unfavorable outcome. Favorable outcome means delivery of a normal healthy infant [9]. Unfavorable outcome refers to pregnancy or reproductive wastage. May be lethal outcome means fetal and infant losses including abortion, stillbirth, neonatal deaths and few post-neonatal deaths related to pregnancy and labour. Sub lethal; no fetal losses, but the live born suffers morbidity arising from exposure to risk during pregnancy and labour, including congenital anomalies, mental retardation nerve palsies, organ injuries and low birth weight [10]. Many researches observed that the use and impact of prenatal care varies across socio-economic, demographic, cultural, and medical risk groups. These characteristics including pre-existing health status, age, education, poverty, and environmental conditions may modify the effects of prenatal care [10]. Also the prenatal care content and use in improving birth, infant and maternal outcomes for women with diabetes, hypertension and other medical conditions are not fully explored [10]. Several lines of evidence link proper prenatal care with reduced infant mortality rates [11]. In 1940, US infant mortality rate was 47 per 1000 live births [9]. By 1994, the infant mortality rate declined to 8.0 infant deaths per 1000 live births. They found low infant deaths in the women who received early and adequate prenatal care [11]. In Connecticut, USA, the elimination of non-adequate care could reduce infant mortality by an overall estimated 15%. Among black infants, non-adequate care is more common, and its elimination could result in an estimated 24% infant mortality reduction [11]. Life begins not only at birth but also before conception. Preconception care including premarital care is defined as assessment of future couples before conception occurs. The health and diet of the parents can affect the early development and future wellbeing of their child [12].

### Aim of the Study

The aim of this study was to find out whether there is any relation between pregnancy outcome and prenatal care (PNC). What are the demographic factors affecting the pregnancy outcome of mothers delivered at El-Jamahiriya hospital (parity, education, maternal age).

### Subjects and Methods:

A retrospective cohort study of delivered women at Al-Jamahiriya hospital was used. It included all delivered women admitted to the post-natal and post-operative wards at Al-Jamahiriya hospital on 1<sup>st</sup> June- 31<sup>st</sup> August 2007. The sample size was 300 delivered women. Interview questionnaire and a record of each woman's prenatal care and the adverse perinatal outcomes of interest were extracted retrospectively from their case notes. PNC records were checked for personal data, time of first visit, number of visits, measurement (BP, Wt, Ht), investigations (Hb level, urine examination, Blood group and Rh), and supplementation (iron and folic acid). Data on delivery collected from post-natal and post-operative files. Data was analyzed by SPSS program.

### Results:

The 300 women were interviewed. Maternal age was defined as the age of mother in completed years at the time of delivery. The study reported that 47.3% of the mothers aged 20-29 years, 66.7% married at 20-29 years, 21% married <20 years, 34.7% married to skilled and semiskilled men, 67% of mothers were housewives, 37% of husbands and 40.7% of mothers had a university level of education. Kotelchuck (1994) [13] developed the adequacy of prenatal care utilization (APCU) index. It categorized ANC utilization by two independent and distinctive dimensions: adequacy of initiation of antenatal care and adequacy of received services. The adequacy of the timing of initiation of antenatal care indicated by early initiation. WHO recommended that registration before or at 16 weeks of gestation is considered as "early initiation" [13]. The study reported that 94% of the women attended PNC clinic, 73% registered before 16 weeks of gestation, 46% of mother had >8 PNC visits & only 28.3% received 2 doses of Tetanus Toxoid Vaccine. The present study recorded that 60% of and only 17.3 % of mothers had recorded height during prenatal visit. The content of PNC was studied. The study reported that only 52.3% of women were investigated for HIV, HBV, HC, and syphilis (VDRL test) during PNC visits.

We first described the fetal outcome according to demographic characteristics, and prenatal care utilization. In order to understand the independent roles of biological vs. social factors in the association with adverse birth outcomes. We categorize fetal outcome as alive and healthy, alive and not healthy, and stillbirths. Maternal outcome was classified to healthy, alive with postpartum complications and death.

The present study reported that there were significant differences in the fetal outcome as the socio-economic status was concerned. Prenatal care was related significantly to the husband's occupation as  $\chi^2_{28} = 39.3$   $P = 0.001$ . Women who were married to businessmen 31% had a healthy baby as compared to those married to skilled or semiskilled men where 53% of them had an unhealthy baby. Also maternal work was significantly related to baby's status at birth where  $\chi^2_{24} = 36.7$  &  $P = .001$ . As regards the women's job, professional and semi-professional women had better fetal outcome as compared to others. Parent education was significantly related to fetal outcome where,  $\chi^2_{28} = 15.1$  &  $P = 0.04$  and  $\chi^2_{28} = 15.9$   $P = 0.04$  for maternal and paternal education. Delivery of a healthy baby significantly related to number of PNC visits ( $\chi^2_{52} = 26.41$  &  $P = 0.034$ ). Parity was significantly related to delivery of healthy baby where  $\chi^2_{22} = 38.3$  and  $P = 0.001$ . About one third (34%) of woman who had five or more deliveries had delivered an unhealthy baby.

The present study reported significant differences between the number of the PNC and delivery of a healthy baby. Also the study reported that there was a positive relation between early registration and number of PNC. The present study found significant relation between early registration and the number of PNC visit,  $\chi^2_{52} = 345.0$  &  $p = 0.001^{**}$ . The women who were registered early had attended prenatal care more. Also maternal outcome was significantly related to early initiation of prenatal care as  $\chi^2_{22} = 36.04$ ,  $p = 0.002$ . Mothers who had no PNC had more complications as hypertension and postpartum hemorrhage (16.7%) as compared to those registered before or at 16 weeks (11.9 %). Also healthy mothers 88.1% registered before or at 16 weeks as compared to 83.3 % of those had no PNC

Characteristics	No.	%
<b>a) Current age/year</b>		
i. <20	8	2.7
ii. 20-29	142	47.3
iii. 30-39	136	45.3
iv. ≥40	14	4.7
<b>b) Husband 's occupation</b>		
i. Professional & semiprofessional	52	17.3
ii. Skilled & semiskilled	105	35.0
iii. Unskilled	62	20.7
iv. Others	75	25.0
v. Not working	6	2.0
<b>c) Women's occupation</b>		
i. Professional & semiprofessional	51	17.0
ii. Skilled & semiskilled	48	16.0
iii. House wife	201	67.0
<b>d) Women's education:</b>		
i. Illiterate	15	5.0
ii. Read & write	13	4.3
iii. Elementary	88	22.7
iv. Secondary	83	27.7
v. University & higher	121	40.3
<b>e) Husband 's education:</b>		
i. Illiterate	6	2.0
ii. Read & write	19	6.7
iii. Elementary	84	28.0
iv. Secondary	81	27.0
v. University & higher	110	36.7

**Table 1:** Socio -economic characteristics of the women delivered at El-Jamahiriya hospital 2007



Characteristics	Alive & healthy		Alive & unhealthy		Test of significant x - P
	No.	%	No.	%	
	200	66.7	100	33.3	
<b>1. Current age/year</b>					
a) <20	7	3.5	1	1.0	$\chi^2 = 9.80$ P= 0.13
b) 20-29	99	49.5	43	43.0	
c) 30-39	88	44.0	48	48.0	
d) ≥40	6	3.0	8	8.0	
<b>2. Husband 's occupation</b>					
a) Prof. & semipro.	44	22.0	8	8.0	$\chi^2 = 39.3$ P=001**
b) Skilled & semiskilled	52	26.0	53	53.0	
c) Unskilled	35	17.5	27	27.0	
d) Others (businessmen)	63	31.5	12	12.0	
e) Not working	6	3.0	0	0.0	
<b>3. Women's occupation</b>					
a) Prof. & semipro.	48	24.0	3	3.0	$\chi^2 = 36.7$ P=.001****
b) Skilled & semiskilled	21	10.5	27	27.0	
c) House wife	131	65.5	70	70.0	
<b>4. Women's education:</b>					
a) Illiterate	7	3.5	8	8	$\chi^2 = 15.1$ P=0.04*
b) Read & write	13	6.5	0	0	
c) Elementary	45	22.5	23	23	
d) Secondary	49	24.5	34	34	
e) University & higher		43.0	35	35	
<b>5. Husband 's education:</b>					
a) Illiterate	6	3.0	0	0	$\chi^2 = 15.9$ p=0.04*
b) Read & write	16	8.0	3	3	
c) Elementary	63	31.5	21	21	
d) Secondary	55	27.5	26	26	
e) University & higher	60	30.0	50	50	

Table 2: Socio-economic status of the delivered women and fetal outcome

Characteristics	Alive & healthy		Alive & unhealthy		Test of Sig
	No.	(%)	No.	(%)	
<b>Total</b>	200	(66.7)	100	(33.3)	
<b>1. Age at marriage/ year</b>					
a) <20	40	(20)	20	(20)	$\chi^2 = 8.43$ P=.07
b) 20-29	140	(70)	70	(20)	
c) 30-39	20	(10)	10	(10)	
<b>2. Parity /delivery:  </b>					
a) Nullpara :	78	(39.0)	35	(35)	$\chi^2 = 38.3$ p= 0.001**
b) 1-4	89	(44.5)	31	(31)	
c) ≥5	33	(16.5)	34	(34)	
<b>3. Spacing :</b>					
a) <12months	195	(97.5)	62	(62)	$\chi^2 = 19.8$ P=.07
b) 13-24 months	5	(2.5)	38	(38)	

Table 3: Fetal outcome and reproductive characteristics of mothers





Items		No	%
PNC Attendance	Yes	282	94
	No	18	6
Time of the first PN visit	<16wk	219	73
	16-28wk	81	27
Number of PNC visits	<4	41	13.6
	4-8	120	40.0
	>8	139	46.4
Blood pressure	Yes	277	92.3
Weight /Kg	No	23	7.7
	Yes	180	60
Height /cm	No	120	40
	Yes	52	17.3
Serology (HIV,HBV,HCV,&VDRL test)	Yes	157	52.3
	No	143	47.7
Urine analysis	Yes	270	90
	No	30	10
Hb%	Yes	282	94
	No	18	6
Blood gp	Yes	279	93
	No	15	5
Supplementation (Iron mg/day)	<20	45	15
	21-60	46	15.3
	>60	209	69.7
TT Vaccine:	First dose	215	71.7
	Second dose	85	28.3

**Table 4:** Utilization of prenatal care by delivered mothers at Al-Jamahiriya hospital 2007



Pregnancy out come:	No PNC	≤16wk	>16wk	Total
<b>Fetal Out come</b>				
Total	18(100.0)	219(100.0)	63(100.0)	300(100.0)
Alive healthy	17(94.40)	206(94.6)	57(90.5)	278(92.7)
Alive with congenital anomalies	0	1(0.4)	1(1.6)	2(0.7)
Still birth & Neonatal death	0	1(0.4)	1(1.5)	2(0.7)
Intrauterine fetal death( stillbirth)	1(5.6)	1(0.4)	0	2(0.7)
Others (birth injuries)	0	10(4.6)	4(6.4)	14(4.7)
	$\chi^2=11.29$		$p=0.731$	
<b>Birth weight/kg</b>				
<2.5kg	2(11.1)	24(11.0)	4(6.4)	30(10.0)
2.5 - 3.9kg	14(77.8)	172(78.5)	55(87.2)	241(80.3)
≥ 4kg	2(11.1)	23(10.5)	4(6.4)	29(9.7)
	$\chi^2=3.00$		$p=0.96$	
<b>Maternal outcome</b>				
Healthy mothers	15(83.3)	193(88.1)	54(85.7)	262(87.3)
Total cases of Obstetric complications	3(16.7)	26(11.9)	9(14.3)	38(12.7)
PPH	1(5.6)	2(0.9)	1(1.6)	4(1.3)
HTN	2(11.1)	10(4.6)	4(6.3)	16(5.3)
Anaemia	0	12(5.4)	4(6.3)	16(5.3)
DM	0	2(.9)	0	2(0.8)
Death	0	0	0	0
Total	18(100)	219(100)	63(100)	300(100)
	$\chi^2=36.04$		$p=0.002^{**}$	

Note: DM: diabetes mellitus, PPH: Postpartum hemorrhage, and HTN: essential hypertension.

**Table 5:** Pregnancy Outcome and Timing of The first PNC Visits (300):

Pregnancy outcome	Number of PNC visits				Total
	No PNC	<4	4-8	>8	
<b>Total</b>	18(100)	33(100)	109(100)	139(100.0)	300(100.0)
<b>1. Fetal outcome</b>					
• Alive healthy baby	17(94.4)	29(87.9)	105(95.5)	130(93.5)	281(93.6)
• Alive with congenital anomalies	0	1(3.0)	1(0.9)	0	2(0.7)
• Still birth	1(5.6)	2(6.1)	3(2.7)	09(6.5)	15(5.0)
• Neonatal death	0	1(3.0)	1(0.9)	0	2(0.7)
Total	18(100)	33(100)	110(100)	139(100)	300(100)
	$\chi^2=26.41$		$p=0.034^*$		
<b>2. Birth weight/kg</b>					
• <2.5	2(11.1)	6(18.2)	11(10.0)	10(7.2)	29(9.7)
• 2.5 - 3.9	14(77.8)	26(78.8)	88(80.0)	114(82.0)	242(80.6)
• ≥ 4	2(11.1)	1(3.0)	11(10.0)	15(10.8)	29(9.7)
	$\chi^2=4.58$		$p=0.59$		
<b>3. Maternal outcome :</b>					
• Healthy	15(83.3)	31(93.9)	91(83.5)	125(89.9)	262(87.3)
• PPH	1(5.6)	0	2(1.8)	1(0.7)	4(1.4)
• HTN	2(11.1)	2(6.1)	5(4.6)	7(5.2)	16(5.3)
• Anaemia	0	0	11(10.1)	5(3.7)	16(5.3)
• DM	0	0	0	2(1.5)	2(0.7)
• Death	0	0	0	0	0
	$\chi^2=17.1$		$p=0.14$		

**Table 6:** Pregnancy outcome and number of PNC visits:

## Discussion:

There are possible socio-demographic and reproductive factors that may influence the utilization of PNC and especially those factors, which may effect the time and the number of the PNC visits. These factors are current maternal age, age at marriage, parity, spacing, education of the husband and wife, wife and husband occupation. The present study reported that the fetal outcome was significantly related to socio-economic status. Prenatal care was related significantly to the husband's occupation ( $\chi^2=39.3$   $P=0.001$ ). Women who were married to businessmen 31% had healthy baby as compared to those married to skilled or semiskilled men 53% of them had an unhealthy baby. Also maternal work significantly related to baby status at birth where  $\chi^2=36.7$  &  $P=.001$ . As regards to women's occupation, professional and semiprofessional women had better fetal outcome as compared to others. Parent education significantly related to fetal outcome where,  $\chi^2=15.1$  &  $P=0.04$  and  $\chi^2=15.9$   $P=0.04$  for maternal and paternal education. Parity was also significantly related to delivery of a healthy baby where  $\chi^2=38.3$  and  $P=0.001$ . Delivery of unhealthy baby significantly related to number of pervious deliveries of five or more (34%).

Teenage pregnancy was usually associated with high maternal and child morbidities and mortalities.

The present study reported that 47.3% of the mothers aged 20-29 years, and 66.7% married at 20-29 years. Early marriage (<20 years) was reported among 21% of delivered mothers. In Jeddah 27.2 % of the women married at age < 16 years and 36.6 % their age at marriage 16-19 years [4]. About two thirds (60.8%) of the pregnant women living in the squatter area in Alexandria-Egypt married at age <20 years and 44.2 % of women living in rural areas in Alexandria were married at age <20 years [4,14]. There are great variations in the age of the women at marriage in the East Mediterranean Region area. Most of them married at a young age (15 -20 years) [4]. The rates of very pre-term delivery, pre-term delivery, very LBW, LBW, SGA, very low Apgar score, low Apgar score and neonatal mortality were higher in teenage pregnancies. They were consistently increased with decreasing maternal age and were always highest among infants born to mothers aged 15 years or younger [14].

Early initiation of prenatal care is important to prevent and treat obstetric and medical complications. It reduces the risk of occurrence of the congenital anomalies which may arise from exposure of the fetus to irradiation, drugs or intrauterine infections (as syphilis, toxoplasmosis, cytomegalovirus, rubella etc) in the early pregnancy [1,2,3,13].

The present study reported that 94% of the women attended PNC clinic, 73% registered before 16 weeks of gestation, and 46% of the mothers had >8 PNC visits. In rural Zimbabwe, 99% two hundred and thirty-five women, aged 16 to 54 years, who had delivered a child, attended the antenatal care facilities at least once. Seventy-three percent came at least five times or more [15,16].

The present study studied the content of PNC. The present study reported that 60 % of mothers had their weight recorded and 17.3 % of them had their height recorded during prenatal visit. The study reported that the majority of mothers had their haemoglobin, urine examination and blood group recorded (94%, 90%, and 93% respectively). Only 52.3% of women were investigated for HIV, HBV, HC, and syphilis (VDRL test) during PNC visits. The present study revealed that 71.7 % of mothers received Tetanus

Toxoid Vaccine (TT V) during pregnancy and only 28.3% of them received 2 doses of TT V.

The present study found significant differences between delivery of a healthy baby and number of PNC visits ( $X^2 = 26.41$  &  $p=0.034$ ). The present study found significant relation between early registration and the number of PNC visit,  $X^2 = 345.0$  &  $p=0.001^{**}$ . The women who were registered early had attended prenatal care more. Also maternal outcome significantly related to early initiation of prenatal care as  $\chi^2 = 36.04$   $p=0.002$ . Mothers who had no PNC had more complications like hypertension and postpartum hemorrhage (16.7%) as compared to those registered before or at 16 weeks (11.9 %). Also 88.1% of healthy mothers registered before or at 16 weeks as compared to 83.3 % of those who had no PNC.

There are many documented evidences that adequate prenatal care is associated with better pregnancy outcome.

In a study which explored the relationship between the number of prenatal visits made by a representative sample of British women and adverse perinatal outcomes; the study revealed an inverse association between the number of prenatal visits and delivery of a low birth weight infant. Infant admission to a special care baby unit and perinatal mortality over the 4-14 prenatal visit range, dissipated at higher levels of antenatal visits [17].

Many investigators using different techniques have evaluated adequacy of prenatal care [13]. The frequency of prenatal visits, and the time of the initiation were used to evaluate the adequacy of prenatal care utilization [1, 3, 5, 7, 8, 9,13].

## Conclusion:

The majority of mothers (94%) who attended PNC clinic, 73% of them initiate PNC at or before 16 weeks of gestation, and 46.3% have 8 or more PNC visits. The present study reported that 80.6% of mothers delivered full-term babies, 66.6% had normal vaginal delivery, 92.7% of fetuses were alive & healthy and 80% of babies' weight was between 2.5-3.9 kg. Majority (87.4%) of delivered mothers had a good outcome.

**Recommendations:**

1. Better health care services with well trained health care personnel and recent technology and equipment.
2. Computerized recording system for maternal and child health care system.
3. Better care at delivery.
4. More research to find out more precise diagnosis of causes of feto-maternal adverse outcome.

**References:**

1. Turmen T. Safe motherhood. Eastern Mediterranean Health Journal; 4 (1) 1998.
2. Hafez G. Maternal mortality: a neglected and socially unjustifiable tragedy. Eastern Mediterranean Health Journal; 1998:vol. 4(1):
3. World Health Organization. Mother- Baby Package. Implementing safe motherhood in countries. Department of Reproductive Health Research . WHO ;Geneva: WHO/RH /MSM/94.11 Rev. 1 ; 1-20.
4. World Health Organization and the World Bank : Maternal Health Around the World poster. 1997.
5. World Health Organization. Antenatal care. Report of technical working group. WHO Geneva: WHO /MSM/96.8 3-26.
6. World Health Organization. Coverage of maternity care : a tabulation of available information. 3rd ed . Geneva : WHO /FHE/93.4 : 1-20.
7. World Health Organization. Antenatal care and maternal health : how effective is it. Geneva : WHO 1992; WHO MSM/92.4 :6-37.
8. World Health Organization. Care of the mother and baby at the health center: A practical guide. Geneva : WHO /FHE/93.2 : 1-46
9. Connecticut's public health department. Maternal and infant health Looking toward 2000-State health assessment. Connecticut's department of public health: 2000 pp.
10. Sloane PD, Slatt LM, Curtis P, Ebell MH & Helton MR. Prenatal care. Essentials of Family Medicine; 1998: 127- 40.
11. Stephanie C & Brundage MD. Preconceptional Health Care. American Family physician journal 2002; 65:12:2507-14.
12. Hull D, Johnston DI. Fetus . Essential Pediatrics . Churchill Livingstone 4th edition; 2000: 31-33.
13. Alexander GR, Kotechuck M. Quantifying the adequacy of prenatal care: A comparison of indices. Public health reports 1996; 107-17.
14. Shama MEM. A study of knowledge, Beliefs and practices of pregnant women during antenatal period in Alexandria. Thesis, MDPH Alex.: High Institute of Public Health, University of Alexandria 1990.
15. Tshimanga M, Makunike B, and Wellington M. Does time of initiation of prenatal care or fetal outcome in low obstetric risk women in Harare -Zimbabwe. Central African J journal of Medicine 1998; 44.
16. Van-den- Heuvel OA, De-Mey WG, Buddingh H, and Bots-ML. Use of maternal care in a rural area of Zimbabwe. Acta-Obstetricia-et-Gynecologica-Scandinavica. 1999: 78/10:838-846.
17. Petrou-S; Kupek-E; Vause-S; Maresh-M. Antenatal visits and adverse perinatal outcomes. European-Journal-of-Obstetrics-Gynecology-and-Reproductive-Biology. 2003 JAN 10; 106/1 (40-49).