Maternal & Infant Risks Regarding Extreme Age of Pregnancy

Naglaa A. El-Sherbiny[1], Mohamed Masoud[1], Alkasseem A. Elgameel[2]

[1]Public Health Dept. Fayoum University, Egypt
[2]Pediatric Dept., Fayoum University, Egypt
[3]Faculty of Medicine, Fayoum University, Egypt

Abstract— Background: Extremes of maternal age are of considerable clinical and public health concern as it plays an important role in infant and maternal health. This study aims to determine the effect of extreme maternal age at pregnancy on a mother and infant's health. Methods: The study was a cross-sectional analytical observational study, conducted on a pediatric outpatient clinic at Teaching Hospital, with a purposive sample of 450 mothers. A structured questionnaire was designed, which included socio-demographic data, factors related to pregnancy care, and factors related to the infant. Results: The main maternal health problem during pregnancy was anemia and pregnancy induced hypertension with a statistically significant association between the mother's age and maternal morbidity. The main causes of baby admission into hospital were diarrhea and acute respiratory diseases, with a statistical significant. Conclusion: There was an agonizing correlation between extreme maternal age and infant health. A serious collaborative effort must be done between social worker in health facilities and community, to rise up awareness about the suitable age of marriage and reproductive health.

Keywords— Extreme maternal age; Infant health; maternal morbidities.

I. INTRODUCTION

The age of the mother typically plays an integral role in infant as well as maternal health. Extremes of maternal age are of considerable clinical and public health concern. Pregnancies of the teen-age (below 18 years) and advanced maternal age (above 35 years) are associated with increased risks of poor outcomes, such as prematurity, growth retardation and chromosomal abnormalities, with increased complications during pregnancy and birth **[1,2].** Children born to young and old mothers also have worse health and higher mortality, than those born to mothers aged 25–34 years **[3,4] .**

A new-born's weight at birth is an important indicator of child health and development. Mothers at the extremes of maternal age (below 20 years and above 35 years) are more susceptible to having low birth weight infants, with increased risk of pre-term delivery **[5].** In addition, gestational age is a determinant of the weight and size of the baby at birth, with a link of maternal age to foetal growth restriction **[6].** The risk of congenital anomalies, such as neural tube defects, Down's syndrome and cleft lip and/or palate, is much more common with older aged mothers **[7].** In contrast to advanced maternal age, it was documented **[8]** that children born to mothers below the age of 18 were at a higher risk of stunting and being underweight, in comparison to the children of mothers aged above 18 years.

Regarding the **Sustainable Development Goals** (SDGs) No. (3): Ensure healthy lives and promote wellbeing for all at all ages. Preventing unintended pregnancy and reducing adolescent childbearing through universal access to reproductive health-care services seeking of reducing child and maternal mortality. This requires effective, affordable interventions, as new-borns caring, breast feeding and proper nutrition, effective immunization, prevention and proper treatment of pneumonia and diarrhoea. These children's health related strategies are then complemented by interventions for maternal health; in particular, skilled care during pregnancy and childbirth **[9].** Globally, the number of deaths of children below five years of age fell from 12.6 million in 1990, to 6.6 million in 2012. In developing countries, the percentage of underweight children below five years old dropped from 28% in 1990, to 17% in 2012. In countries with high mortality rates, these interventions could reduce the number of deaths by more than half and improve the child health status **[10].**

II. AIM OF WORK

This study aimed to determine the effects of maternal age at pregnancy, on a mother and infant's health, whilst exploring the association between maternal age at pregnancy with maternal morbidities and pregnancy outcomes.

Methods: The study was a cross-sectional analytical observational study, concerned with identifying the relation of maternal age with maternal morbidities and pregnancy outcomes. It was conducted on a paediatric out-patient clinic at the University Teaching Hospital. The

sample was a purposive sample, with inclusion criteria of: mother's age above 18 with the babies' age at 2 months or below, coming for examination for specific diseases or a routine follow up. A sample size of 450 mothers was calculated using Epi Info 7, taking into consideration that the proportion of mothers with maternal complications was 50%, with 95% confidence interval and precision of 5%. Finally, the sample was increased by 15% to overcome the problem of no responses and missing data. Participating mothers were interviewed with a structured coded questionnaire, formed of the following sections: Firstly, socio-demographic data related to the mother, that included age at the beginning of pregnancy, residency, level of education and occupation. The second section was related to pregnancy care: gravidity, consanguinity, morbidity related to pregnancy and mode and place of delivery. The third section was related to the infant: determining whether the baby was born full term or pre-mature, weight at birth, birth order, pattern of feeding, frequency and causes of hospital admission.

Ethical approval:

This study was reviewed and approved by the Faculty of Medicine Research Ethical Committee at Fayoum University with a reference number (5) in October, 2015.

Data entry and statistical analysis:

Data was collected, coded and analysed using SPSS software (Version 18) under Windows 7; simple descriptive analysis in the form of percentage distribution, means and standard deviations were done. Suitable inferential statistics were done to test the level of significance, with a confidence level of 0.05.

III.   RESULTS

The total number in the study sample was 450 mothers. Their age range was from 18-40 with a mean age of 25.6 (±5.9) years. 17.1% (N=77) of them were less than 20 years old and 14.2% (N=64) were in the age group of more than 35 years. Two thirds of them, i.e. 66.4% (N=299) were living in urban areas. With regards to education level, 59.3% (N=267) were of high educational level and only 38.7% (N=174) of them were working, while housewives constituted 56.9% (N=256). Only 19.6% (N=88) of the studied mothers had a positive consanguinity and 47.3% (N=213) of them were prime-gravida. Regarding the place and mode of delivery, 56.4% (N=254) delivered in a hospital and 72.7% (N=327) were delivered by caesarean section in hospitals and private clinics. There was a statistically significant association between maternal age groups with different socio-demographics and delivery methods. So prime-gravida, housewife with high education, living in urban areas, and having a positive consanguinity (P=0.000) delivered through caesarean section (P=0.004), and delivered in the hospital (P=0.000) were significantly associated with maternal age. Regarding relation of maternal age with ANC services, there was a statistically significant association between maternal age and time of first ANC visit (P=0.000), while there was no statistically significant association with number of ANC visits (**Table 1**).

Table.1: Socio-demographic, Marriage & Delivery Characteristics related to Maternal age groups

Maternal age groups	Less than 20 years		+20-35 years		+35 years		Total		P value
	N=77	17.1%	N=309	68.7%	N=64	14.2%	N=450	100%	
Residency									
Urban	32	41.6	230	74.4	37	57.8	299	**66.4**	0.000*
Rural	45	58.4	79	25.6	27	42.2	151	33.6	
Level of Education									
Primary	7	9.1	13	4.2	16	25.0	36	8.0	
Secondary	60	77.9	58	18.8	29	45.3	147	32.7	0.000*
High education	10	13.0	238	77.0	19	29.7	267	59.3	
Occupation									
House wife	57	74.0	154	49.8	45	70.3	256	56.9	
Student	18	23.4	2	0.6	0	0.0	20	4.4	0.000*
Working	2	2.6	153	49.5	19	29.7	174	38.7	
Consanguinity									
Positive	27	35.1	54	17.5	7	10.9	88	19.6	0.000*
Negative	50	64.9	255	82.5	57	89.1	362	**80.4**	
Gravida									
Primi	62	80.5	147	47.6	4	6.3	213	**47.3**	0.000*

2-3	15	19.5	149	48.2	38	59.4	202	44.9	
+3	0	0.0	13	4.2	22	34.3	35	7.8	
Place of Delivery									
Home	4	5.2	4	1.3	10	15.6	18	4.0	
Hospital	39	50.6	176	57.0	39	60.9	254	**56.4**	**0.000***
Private clinic	34	44.2	129	41.7	15	23.4	178	39.6	
Mode of Delivery									
Normal vaginal	31	40.3	68	22.0	24	37.5	123	27.3	**0.004***
Cesarean section	46	59.7	241	78.0	40	62.5	327	**72.7**	
ANC visit									
<5 visits	8	10.4	68	22.0	14	21.9	90	20.0	0.068
≥ 5visits	69	89.6	241	78.0	50	78.1	360	**80.0**	
Time of first visit									
During 1st trimester	56	72.7	184	59.5	29	45.3	269	**59.8**	**0.000***
After 1 st trimester	21	27.3	125	40.5	35	54.7	181	40.2	

*P <0.05 is considered significant

In relation to infants, three quarters of them (77.6%, N=349) were born full term; 63.8% (N=287) were normal weight and 58.0% (N=261) were exclusively breast fed during the first 6 months. There was a statistically significant association between the mother's age and maturity of the baby (P=0.000), birth weight (P=0.001) and feeding of the baby (P=0.045) (**Table 2**).

Table.2: Relation between maternal age, new-borns' maturity, birth weight and feeding

Maturity	**Less than 20 years**		**+20-35 years**		**+35 years**		**P-value**
	N=77	**17.1%**	**N=309**	**68.7%**	**N=64**	**14.2%**	
Maturity							
Full term	45	58.4	252	81.6	52	81.3	**0.000***
Pre-mature	32	41.6	57	18.4	12	18.8	
Birth weight							
Normal	41	53.2	211	68.3	35	54.7	
Underweight	36	46.8	87	28.2	23	35.9	**0.001***
Overweight	0	0	11	3.6	6	9.4	
Feeding							
Breast	39	50.6	183	59.2	39	60.9	
Bottle	26	33.8	56	18.1	12	18.8	**0.045***
Mixed	12	15.6	70	22.7	13	20.3	

*P <0.05 is considered significant

The main maternal morbidity problem during pregnancy was anaemia, which constituted 42.2% (N=190); then pregnancy induced hypertension with 11.1% (N=50). However, 37.6% (N=169) of mothers had a safe pregnancy devoid of any risk factors.
There was a statistically significant association between the age of the mother and maternal morbidity during pregnancy (P=0.000). Anaemia constituted 70.1% (N=54) and antepartum haemorrhage 9.1% (N=7) was prevalent in mothers aged below 20 years. The main causes among mothers > 35 years old was pregnancy induced hypertension (28.1% N=18), followed by anaemia (18.8% N=12), then gestational diabetes (6.3% N=4) as shown in **Table 3**.

Table.3: Relation of Maternal Age to maternal morbidities and causes of infant admissions

Maturity	**Less than 20 years**		**+20-35 years**		**+35 years**		**P-value**
	N=77	**17.1%**	**N=309**	**68.7%**	**N=64**	**14.2%**	

Maternal morbidities						
Gestational Diabetes	0	0.0	14	4.5	4	6.3
PIH	2	2.6	30	9.7	18	28.1
Ante-partum hemorrhage	7	9.1	16	5.2	0	0.0
Anemia	54	70.1	124	40.1	12	18.8
No complications	14	18.2	125	40.5	39	46.9

(P-value for maternal morbidities block: 0.000)*

Causes of infant admissions						
Diarrhea	23	29.9	43	13.9	9	14.1
Respiratory tract infections	22	28.6	44	14.2	6	9.4
Diarrhea & respiratory tract infections	4	5.2	12	3.9	17	26.6
Congenital anomalies	3	3.9	19	6.1	2	3.1
Others**	5	6.5	14	4.5	12	18.8
No admissions	20	26.0	177	57.3	18	28.1

(P-value for causes of infant admissions block: 0.000)*

*P <0.05 is considered significant ** Anemia, surgical adenoidectomy, Neonatal hypoglycemia, Convulsions

The mean number of infant hospital admissions during the first year of life, among mothers below 20 years old was 1.1 (±1.6), 20-35 years was 0.6 (±1.2), and more than 35 years was 1.7 (±2.6). There was a statistically significant difference between mothers aged from 20-35 years, and both, mothers below 20 years (P= 0.006), and more than 35 years (P= 0.000). Additionally, there was statistically significant difference between mothers below 20 years, and more than 35 years (P= 0.026).

The main two causes of baby admission into hospital were diarrhoea and acute respiratory diseases, with a percentage of 16.7% (N=75) and 16.0% (N=72), respectively. More than two thirds of mothers with extremities of age were admitted into hospital with their babies due to different causes. Diarrhoea and acute respiratory tract infection were the main causes of baby hospital admission with mothers aged below 20 years, as they constituted 29.9% (N=23) and 28.6% (N=22), respectively, while the main cause in infant's with mothers aged above 35 years was congenital disease,

constituting 26.6% (N=17). There was a statistically significant association between a mother's age and causes of baby admissions into hospitals (P=0.000) (**Table 3**).

Regarding risk factors of maternal morbidities during ANC, multivariate logistic regression analysis determined that amongst mothers aged 20-35, there was a three-fold risk of having maternal morbidities when receiving less than 5 AVC visits [OR 3.3-95% CI (1.9; 5.8)]. Among age group ≥ 35 years, below high education [OR 13.5-95% CI (2.2; 82.6)] and home delivery [OR 41.3-95% CI (3.2; 526.3)] were associated with increased risk to maternal morbidities. On the other hand, for infant admission: among mothers aged less than 20, the risk increased when the infants had positive consanguinity [OR 20.5-95% CI (2.4; 176.0)]. While among age group 20- 35 years, positive consanguinity [OR 7.6-95% CI (3.7; 15.4)], first ANC visit after first trimester [OR 2.3-95% CI (1.4; 3.93)] and prematurity [OR 3.8-95% CI (1.9; 7.3)] were associated with increased risk to infant admission **Table 4.**

Table.4: Odds ratios (95 % CIs) of significant factors related to maternal morbidities and infant admission in different age groups of mothers

Factors	<20	20-35	>35
Maternal morbidities			
ANC less than 5 visits	-----	3.3 (1.9-5.8)	------
Below high Education	-----	-----	13.5 (2.2-82.6)
Home delivery	-----	-----	41.3 (3.2-526.3)
Infant admission			
Consanguinity	20.5 (2.4-176.0)	7.6 (3.7-15.4)	-----
ANC time after first trimester	-----	2.3 (1.4-3.9)	-----
Premature	-----	3.8 (1.9-7.3)	-----

IV.   DISCUSSION

This study focuses on the relationship between mother and infant's morbidities within different maternal age groups, with an emphasis on adolescents and older mothers, who are deemed a high risk category. Mothers younger than 18 are known as a group at high

psychosocial, obstetrical and foetal risk; mothers older than 38 are considered as a group at high maternal and foetal risk [2,11]. There was a negative association between advanced maternal age and health, as the physiological reproductive aging of the mother occurred, affecting the conception process with a wide array of negative birth outcomes, foetal development, low-risk birth, and post-birth development [4]. **The World Health Statistics [12]** reported that 11% of all births worldwide are to girls aged 15 to 19, and the vast majority is in low and middle income countries, with a range from 1 to 229 births/1000 girls. The global adolescent birth rate is 49/1000 girls in this age. Also, complications linked to pregnancy and childbirth for mothers are very common place. Early marriage is associated with a number of poor social and physical outcomes for young women and their offspring [2,13]. They attain lower schooling, lower social status in their husbands' families, have less reproductive control, and suffer higher rates of maternal mortality and domestic violence. Our sample consisted of 17.1% of mothers, who were less than 20 years old, and 14.2% in the age group over 35 years old; the remainder being between 20 to 35 years old. Two thirds of them (66.4%) were residing in urban areas; 58.4% of mothers below 20 years of age were living in rural areas. With regards to educational level, 59.3% were of high educational level and 56.9% of them were housewives. The previous figures related to educational level and being a house-wife, are due to the culture of this high income level community, where although it's preferred that women have a high level of education, the priority however, is taking care of the children as income isn't required. On the flip side, the low income levels prefer primary or even preparatory education, with a combination of cultural and religious arguments backing early marriage. Relieving the family from her economic burden, or alternatively, working from a very young age and thereby generating money for taking financial care of the family, especially in rural areas [14].

The place and mode of delivery were important elements in detecting infant health. In our study, 56.4% of the infants were delivered at hospitals and 72.7% were delivered by caesarean sections. These figures seemed to be contradicted as the percent of caesarean section exceeded the delivery in hospital, but these were related to living in urban areas with availability of both public and private health care facilities (hospital and polyclinics), in which most of the urban population prefer these polyclinics for higher privacy (than public hospitals) and for lower prices (than private hospitals).

Our results established that there was a statistically significant association between maternal health problems during pregnancy and maternal age (P=0.000); the main maternal health problem among age groups below 20 was anaemia, as it constituted 70.1%. This result was in agreement with [13] who said that young aged girls are often forced out of school without education; their health is affected because their bodies are too immature to give birth. On the other hand, pregnancy induced hypertension was considered the main cause in ages above 35, with a level of 28.1%. These findings were similar to the results of some studies which are known to have reported that the number of mothers with chronic hypertension increased with advanced maternal age (starting from the age of 35 years) [3]. However, 37.6% of mothers had a safe pregnancy without any risk factors; this is due to the proper ANC check-ups, as for this group, it's either a precious pregnancy so they are keen to follow all instructions of ANC, or they have prior experience with several pregnancies.

The current work revealed a statistically significant association between the age of the mother, maturity of the baby (P=0.000) and birth weight (P=0.001). For the maternal age group aged below 20, 41.6% and 46.8% of the babies were preterm and underweight, respectively. Our results were in agreement with [15] who documented that young age can be a proxy for "short stature, low body weight in relation to height, and greater likelihood of inadequate weight gain during pregnancy, along with difficulty of delivery". Amongst mothers above 35 years old, 18.8% of their babies were premature, while 35.9% were underweight [16] was inconsistent with our results, since they reported that advanced maternal age positively linked with birth weight.

As pertains to the numbers of hospital admissions, hospitalisation duration of infants born to mothers above 35 years of age (1.7±2.6) and mothers below 20 years old, (1.1±1.6) was longer than that of mothers aged between 20-35 (0.6±1.2). Similar to our results, [3] calculated that children born to mothers aged ≥ 40, had a much longer period of hospital stays than children born to younger mothers. This current study result disagreed with [17] who reported that the risk of children being admitted to hospital declined with increasing maternal age.

In the present work, more than two thirds of the mothers with extremities of age were admitted to hospitals with their babies due to different causes, with a statistically significant association between the age of the mother and causes of baby admission to the hospital (P=0.000). Diarrhoea and acute respiratory tract infection were the main causes of baby hospital admission with mothers aged below 20 years, as they constituted 29.9% and 28.6%, respectively. The main cause in infants with mothers aged above 35 years, was congenital disease in 26.6%. Our outcomes were in agreement with [18]

results, which indicated that advanced maternal age accompanies many negative birth outcomes, such as malformations and chromosomal abnormalities. However, [15] documented that children born to mothers aged below age 27–29 are at a higher risk of poor health outcomes.

Conclusion: The study concluded that there was an agonizing correlation between extreme maternal age and infant health. Anaemia and pregnancy induced hypertension were the main maternal complications during pregnancy. Diarrhoea, acute respiratory diseases and congenital anomalies were the main three causes for infant hospital admission. There is a growing need for collaborative efforts between social worker in health facilities and community, to rise up awareness about the suitable age of marriage and basic knowledge of reproductive health.

Ethical approval and consent to participate:

This study was reviewed and approved by the Faculty of Medicine Research Ethical Committee at Fayoum University. It was conducted after explaining the study objectives, and confidentiality was expressed to the participant mothers.

Consent to publication:

Before distributing the questionnaire a written informed consent with the data explaining the purpose of the study was obtained from mothers for their acceptance to be involved in the study and their agreement for publication of the results. Each mother had the right not to participate in the study or withdraw at any time.

Availability of data and materials: please contact authors for data request

Competing interest:

There is no conflict of interest, as there are no commercial or financial relationships (no grant or any financial support, equipment) from any institution or organisation that could be construed as a potential conflict, and all the expenses are covered by the authors. There are no financial competing interests (political, personal, religious, ideological, academic, intellectual, commercial or any other) to declare in relation to this manuscript.

Authors' contributions:

NE: conceived the study, design; carried out the questionnaire design, participated as interviewer, made the pilot testing of the questionnaire, performed statistical analysis and shared in drafting, editing and revision of the manuscript. MM: calculation of sample size, participated as interviewer of the questionnaire (data collection), performed statistical analysis and shared in revision of the manuscript. AE: shared in questionnaire design, performed the clinical examination and diagnosis of children's diseases, and helped in drafting the manuscript. All authors read and approved the final manuscript.

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