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Pregnancy outcomes amongst adolescents/young adults at tertiary-care hospital in low-middle-income country: ten-year retrospective record-review

Azra Amerjee[1], Dur e Shahwar[2], Sana Sheikh[3], Iffat Ahmed[4], Nuruddin Mohammed[5], Ifrah Ali Baig[6], Raima Hashmi[7]

1,4,5 Department of Obstetrics and Gynecology, Aga Khan University, Karachi, Pakistan; **2,3** Aga Khan University, Karachi, Pakistan; **6,7** 4th Year Medical Student, Aga Khan University, Karachi, Pakistan

Correspondence: Iffat Ahmed. **Email**: iffat.ahmed@aku.edu

Abstract

Objective: Adolescent pregnancies are known to be associated with adverse outcomes. Our objective was to compare pregnancy outcomes amongst adolescents (young adolescents YA: 15-17 years; older adolescents OA: 18-19 years) and young adults (20 to 25 years)

Methods: Study was conducted at Aga Khan University Hospital, Karachi. Ten-year retrospective record review was done through convenience sampling. Data was collected on predesigned proforma. Participants were 396 primiparous adolescents (15-19 years) with singleton low-risk pregnancy. Reference-group included 410 primiparous, low-risk, young adults. Pregnancies complicated with preexisting diabetes mellitus, chronic hypertension, renal disorders or cardiac diseases were excluded. Maternal /neonatal outcomes were compared amongst groups.

Results: Out of 806 charts reviewed, 75 (9.3%) were YA, 321 (39.8%) were OA and 410 (50.9%) were 20-25 years old young adults. Most of the un-booked cases were in young adolescents; 17 (22.7% YA), 41 (12.8% OA) and 33 (8.0%

reference -group) (p-value 0.001). This group also booked at a later gestational age; YA (19.6±10.4 weeks), OA (17.2±9.3 weeks) and controls (15.5n±8.8 weeks) (p-value 0.002). Gestational age at delivery was not significantly different among the groups. Adolescents had a decreased likelihood of cesarean section with youngest group having 29% less chance of cesarean delivery (OR 95% CI 0.41, 0.2) compared to women of 20-25 years of age. Difference in maternal/neonatal outcomes remained insignificant between groups at univariate and multivariate analysis.

Conclusion: Maternal/neonatal outcomes in adolescents were comparable to young adults. Good antenatal care, evidence-based protocols, and strong family backing may reduce risks to mothers/babies in adolescent pregnancies.

Keywords: Adolescent pregnancy, low-middle income countries, maternal outcomes, neonatal outcomes, teenage pregnancy

Introduction

According to World Health Organization (WHO), adolescent pregnancy is defined as pregnancy in girls aged between 10 to 19 years. More than 90% of these births occur in low/middle income countries (LMIC) [1]. Teenage pregnancy is considered as high-risk with serious health implications for mother and child, due to double burden of reproduction and growth and physiological/ anatomic immaturity [2, 3]. Reproductive immaturity, defined as 'gynecological age' (number of years from menarche) less than 3 years predisposes younger adolescents to pregnancy complications [4, 5] . Besides, low socioeconomic status, tobacco/alcohol consumption, lack of prenatal care/ social support, and malnutrition have also been identified as factors contributing to increased obstetric and neonatal complications in pregnant adolescents [6-8]. In developing countries, pregnancy and delivery complications are leading causes of mortality amongst girls aged 15-19 years [9-11]. However, currently available evidence regarding outcomes for teenage pregnancies is conflicting [12] . Several studies have shown adolescent pregnancies to be associated with adverse outcomes like preterm births, small for gestational age, intrauterine growth restriction, cephalo-pelvic disproportion, postpartum hemorrhage, preeclampsia/eclampsia, anemia and neonatal deaths [13, 14]. Conversely, studies from developed countries with a robust maternal and neonatal healthcare system have reported that except for preterm deliveries, teenage pregnancies overall have good outcomes[6].

To the best of our knowledge, available literature for teenage pregnancies in LMIC has mostly focused on women of rural areas with poor literacy rate and belonging to low socio-economic group.[12] Poverty itself is related with issues of health seeking behavior, maternal nutrition, health literacy and many factors which affect pregnancy outcomes independent of age of the mother. Pregnancy and neonatal outcomes in middle and high income literate population of a LMIC have not been studied well. Exploring pregnancy outcomes in this population will reduce the confounders and effect of young maternal age can be studied better. Hence the aim of this study was to compare pregnancy outcomes amongst adolescents (young and older) and young adults between 20 to 25 years age at a tertiary level hospital in urban setting catering middle to high income population.

Methods

This was a 10-year retrospective record review of adolescent primiparas between 13 to 19 years of age, with singleton pregnancy and cephalic presentation, who delivered at Aga Khan University Hospital (AKUH), Karachi, after 24 weeks of gestation, from 1st January 2007 to 31st December 2016. Primiparas between 20 and 25 years who delivered in the same period were taken as controls. Women aged more than 25 years were not included in our study to avoid confounding effect of increasing maternal age on pregnancy and delivery. Keeping preterm birth rate in adolescents at 23.6% and in controls at 15.7%, power at 80% and alpha value at 5%, sample size was calculated as 396 in each group, using the WHO sample size calculator[15]. Data collection was started after obtaining exemption for the study from the Ethical Review Committee of Aga khan University.

Out of 44,191 deliveries in the 10-year period, 904 deliveries (2.05%) were among teenage women and 12,121 deliveries (27.43%) were in women between 20 to 25 years. Three hundred and ninety six charts of adolescent pregnant women and 410 charts of women aged between 20 to 25 years were selected through convenience sampling. As lower 'gynecological age' is related to worse pregnancy outcomes, we sub-divided adolescent pregnancies into young (15-17 years) and older adolescents (18 -19 years) [5] as has been recommended by Center for Disease Control and Prevention [16]. We did not further subdivide the group into <15 years as we did not have any gravidas less than 15 years in our study population.

Charts were reviewed and data was collected on a predesigned proforma. All pregnancies complicated with any preexisting medical problems like diabetes mellitus, chronic hypertension, renal disorders, autoimmune diseases or cardiac diseases were excluded.

The parameters recorded for each patient included maternal demographics, gestational age at antenatal booking and at delivery, antenatal booked/un-booked status, maternal weight and Body Mass Index (BMI) at antenatal booking/delivery, induction of labour/ spontaneous onset of labour, use of epidural analgesia during labour and mode of delivery. Maternal complications compared among the three groups included preterm delivery, hypertensive disorders of pregnancy, gestational diabetes, antepartum hemorrhage (placental abruption and placenta previa), anemia and postpartum hemorrhage (PPH). Comparison of perinatal outcomes included APGAR scores, birth weights, neonatal growth centiles, presence of congenital abnormalities, admission to NICU, still birth and neonatal deaths.

The data was entered and analyzed by using SPSS version 19.0. Means and standard deviations and proportions were estimated during descriptive analysis. Crude and adjusted odd ratios were calculated using logistic regression. Multivariate analysis was done to adjust for pre-pregnancy BMI and gestational weight gain (GWG). Weight/BMI recorded during first trimester is considered as pre-pregnancy weight/BMI which is used to determine the effect of women's nutritional status on her pregnancy outcomes. GWG variable was developed by subtracting weight at delivery from weight in first trimester. Multivariate analysis was done for a sub-set of 376 women who registered during first trimester of pregnancy and their weight and BMI were recorded during this time period. We could not perform multivariate analysis for neonatal outcomes and some of the maternal outcomes because of sparse data.

Working definitions

- *Low birth weight: Neonatal birth weight less than 2500grams*
- *Postpartum hemorrhage (PPH): Documented blood loss of ≥500 ml during vaginal and ≥1000ml during Caesarean section or a difference in hemoglobin level of ≥3 grams before and after delivery*
- *Hypertensive disorders of pregnancy: Blood Pressure readings of ≥140/90mmHg at least 4 hours apart, with/without ≥300mg urinary proteins in 24 hours, developing after 20 weeks gestation in previously normotensive non-proteinuric women*
- *Gestational diabetes: Glucose intolerance of variable degree with onset or first recognition during pregnancy*
- *Anemia: Hemoglobin levels of <11gm/dL*
- *Neonatal Growth Centile: Calculated by using Intergrowth 21st standard/references, which is a robust clinical tool to monitor and evaluate neonatal well-being*[17]
- *Antenatal un-booked cases: Patients who attended for less than four antenatal visits.*

Results

Altogether 806 medical records of pregnant women were reviewed. Out of 806, 75 (9.3%) were 15-17 years old young adolescents (YA), and 410(50.9%) were 20-25 years old adults (controls). Highest proportions (22.7%) of un-booked cases were in YA (p-value 0.001). This group also booked at a later gestational age than the other two groups (p-value 0.002). However, gestational age at delivery was not significantly different among the three age-groups.

Three hundred and seventy six (46.42%) women were booked in the first trimester. Data for first trimester weight/BMI, which was considered equivalent to pre-pregnancy weight/BMI, was available for this group of women. Pre-pregnancy weight/BMI and GWG was not significantly different across the groups (Table 1).

Maternal age had a negative correlation in availing epidural analgesia during labor. Mothers between 15-17 years of age were 3.5 times likely not to opt for epidural analgesia during labour (OR 95% CI 1.5, 7.9) whereas 18-19 year old women had odds of 2.7 times (OR 95% CI 1.7, 4.0) of not requesting epidural analgesia. Mode of delivery was also independently associated with age of mother, with decreased likelihood of cesarean section in younger mothers (Crude OR 0.71OR 95% CI 0.41, 0.2) compared to women of 20-25 years of age. At univariate analysis, we found that being a teenager did not put women at a risk of having complications during pregnancy and child birth (Table 2).

Model was adjusted for pre-pregnancy BMI and weight gain during pregnancy. Even after adjusting for these potential confounders we did not find an association between age of the mother and any adverse pregnancy outcomes. Association of mode of delivery with age was not found at multivariate analysis. (Table 3).

Out of 806 deliveries, 17 (2%) babies were stillborn. Only 1 baby belonged to the youngest age group and highest numbers (n=9) were found in the 20-25 years group. A protective effect of age was observed on status of baby at birth

(15-17 years OR = 0.59; 18-19 years= 0.99) but this was not statistically significant. Regarding other neonatal outcomes like neonatal growth centile < 10%, birth weight < 2500 grams, congenital anomaly and NICU admission; none were found to have statistically significant association with age of the mother. Hence, we did not find adolescent mothers having any higher risk of adverse neonatal outcomes compared to mothers of 20-25 years of age at univariate analysis. (Table 4)

Discussion

The results indicate that in our study population, there is no significant difference in pregnancy outcomes between adolescents (young and older) and young adults (20-25 years) [18].

Over 10 years study period, 2.05% of total deliveries at AKUH were among adolescents. This was comparable to rate of adolescent deliveries in developed countries [7, 13, 19, 20]. According to Pakistan Demographic Health Survey 2013-14, adolescent pregnancy rate in Pakistan is 8%[21]. Our results are much lower and may not be reflective of the true picture of Pakistani population. These women mainly belonged to upper-middle-income families where early marriages are less common. Shah et al conducted similar study in public sector hospitals of Pakistan and found the frequency of teenage pregnancies to be higher at 5.8% [12].

The focused antenatal care model of WHO recommends at least four antenatal visits with the first visit before 16 weeks gestation [11] . More than 75% of our patients were booked. Women between 20 and 25 years showed a significantly higher booking status as compared to both the groups of adolescents[8, 19, 22-24] (Table 1). Also, the gestational age at booking was earlier (before 16 weeks gestation) in adults [18] and these differences were statistically significant (Table 1). In our culture extended families are commoner and adolescent girls being younger are more likely to be dependent on their families for decisions [12]. Elders may also influence decisions regarding antenatal booking and its timing.

Out of 806 participants, booking BMI was available for patients booked in first trimester (n=372). Pre-pregnancy BMI, among these 372 patients, was normal with average GWG. No significant difference was seen in the booking BMI or GWG across the three groups. Others have reported mean booking BMI to be significantly higher in adults as compared to adolescents [12, 18, 25]. This difference is not apparent in our study as we included women only up to 25 years in our control group while others included subjects up to 35 years of age.

Vivatkusol et al showed that maternal outcomes were significantly affected by extremes of weights. Anemia and preterm deliveries were more common among underweight women whereas overweight women were more prone to cesarean section and preeclampsia [26]. In our study there was no difference in maternal outcomes on multiple regression analysis after adjusting for BMI. The reason for this difference may be that pre-pregnancy BMI was available for only a small sample of women (n=372) and study was not powered for this sub-sample analysis. Scarcity of data is a limitation of this retrospective study.

Tyrberg et al have reported that adolescent population in Sweden availed intrapartum epidural analgesia more frequently than adults [7]. Conversely, use of epidural analgesia during labour was seen to be significantly less in our teenage patients compared to adults. This may be related to several local myths regarding use of epidural analgesia, which may influence the decision [27]. Again, cultural issues would lead to these decisions being mainly taken by older family members who are more likely to be influenced by these myths [12].

Several studies have reported anemia to be more common in adolescent pregnancies [5, 18, 24]. This may be because majority of subjects in those studies were unmarried women with poor social support, belonged to disadvantaged socioeconomic background and had poor nutritional status [14, 16, 19, 24] . Increased iron requirement with commencement of menstruation and growth spurt, along with poor iron stores may be other postulated mechanisms for anemia in adolescent pregnant women [19]. Our study did not find any difference in frequency of anemia in adolescents and adults [28]. Probable reasons could be higher socioeconomic ranking, good family support and being married. Besides, nearly three-fourths of study population was antenatally booked and was prescribed iron and folic acid supplements throughout pregnancy.

On univariate analysis, there was a significantly reduced risk of Caesarean delivery in adolescents compared to adults [12-14, 16, 19]. Higher vaginal delivery rates in adolescents may be due to, better myometrial function, physical endurance, greater connective tissue elasticity, better cervical compliance and tendency for smaller babies [13, 19] . It may also be reflective of obstetrician concern regarding impact of caesarean delivery on the future obstetric career in young gravidas [7, 13]. Dutta et al have reported double the chance of cesarean deliveries in their population of adolescents compared to adults [24] while others found no difference in the mode of delivery between the two groups [3, 25, 28].

Few studies have reported higher risk of postpartum hemorrhage (PPH) in adolescents [14, 16] while Tyrberg et al found it to be less frequent in their teenage mothers [7]. There was no significant difference in the occurrence of PPH among our groups and is comparable with other studies [3, 12, 13, 18, 25]. Likely reasons for this are; routine antenatal iron supplements, identification of patients at high risk for PPH, active management of third stage of labour and timely intervention. On-floor senior cover and trained labour room team may be other factors that may reduce the risk. This suggests that there may be factors, other than patients' age that are responsible for bleeding during delivery [3].

Risks of PTB and LBW in teenage mothers have been found to be higher in several studies [24, 25, 29]. Our results showed no such difference among adolescents and adults [6, 7]. We calculated the growth centile of neonates using the Intergrowth 21st standard/references chart adjusting for the gender as well as gestational age at birth, to confirm any difference in the growth centiles among the neonates in the three groups. Neonatal weights of < 10^{th} centile were comparable between the groups. This difference may be attributed to the dissimilarity in race and social status of our population. Besides unhealthy habits like smoking and alcohol intake are not common in our culture. Being married with good family support may have contributed to reduced PTB and LBW risks in our study population.

Overall our results differ from other institutions of Pakistan. We believe the reason for this is that, other studies in Pakistan have mainly been conducted at government tertiary care centers or in community hospitals that usually cater to the low and lower-middle class population who lack education and access to proper antenatal care [12,28]. Most of these patients are non-booked. Prenatal care is important to screen for the biological risks of adolescent pregnancy like; anemia, infections and cervical shortness. Besides, antenatal care also helps provide psychosocial support in stressful situations which teenaged mothers often encounter [12, 28]. Emotional stress can be a cause of preterm delivery by causing endocrine disturbances [28]. Our study was conducted in a private, fully equipped, centrally located, tertiary care hospital catering to an educated, urban population belonging to relatively advantaged socio-economic group who have awareness regarding importance of antenatal care. Other factors influencing our results might be adherence to evidence-based protocols, for antenatal/intrapartum care and commendable neonatal care facilities. Moreover, our hospital has a system of patient recall for antenatal visits through SMS and telephonic calls. These factors could have had an influence on our results that may indicate that good quality antenatal care with observance of evidence based protocols, along with strong family support may reduce risks to mothers and their babies in adolescent pregnancies. However, generalization of these results to the larger segment of population in low-middle income countries should be done with caution.

Conclusion

This study showed that age of the pregnant women alone may not be a risk factor for adverse obstetric outcomes. Good quality antenatal care with observance of evidence based protocols, along with strong family support may reduce risks to mothers and their babies in adolescent pregnancies.

Limitation

This study is retrospective-designed and conducted at a single tertiary care hospital in a low-middle income country. Hence its results may not be extrapolated to developed countries.

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Tables

Table 1: Baseline characteristics of study participants by groups

Variables	**15-17 years old** **N=75** **n (%)** **Mean±SD**	**18-19 years old** **N=321** **n (%)** **Mean±SD**	**20-25 years old** **N=410** **n (%)** **Mean±SD**	**P-value**
Pre-pregnancy Weight *	55.6±8.1	56.1±14.0	58.2±12.0	0.25
Gestational weight gain*	10.7±5.6	12.0±9.8	12.7±4.9	0.36
Pre-pregnancy Body Mass Index at booking*	23.1±3.7	22.1±3.9	23.0±4.4	0.13
Booking status:				
Booked	*58 (77.3)*	*280 (87.2)*	*377 (92.0)*	*0.001*
Un-booked	*17 (22.7)*	*41 (12.8)*	*33 (8.0)*	
Gestational age at booking	*19.6±10.4*	*17.2±9.3*	*15.5±8.8*	*0.002*
Gestational age at delivery	39.33±1.0	38.5±1.7	38.7±1.7	0.13

**n=372*

Table: 2 Un-adjusted multivariate model for pregnancy and delivery outcomes between pregnant women in three age groups

Variables	15-17 years old N=75 n (%)	18-19 years old N=321 n (%)	20-25 years old N=410 n (%)
Hypertension during pregnancy:			
No	69 (92)	296 (92.2)	373 (91.0)
Yes	6 (8.0)	25 (7.8)	37 (9.0)
OR (95% CI)	0.87 (0.35, 2.1)	0.85 (0.50, 1.4)	1
Gestational Diabetes Mellitus:			
No	73 (97)	309 (96.3)	397 (96.8)
Yes	2 (2.7)	12 (3.7)	13 (3.2)
OR (95% CI)	0.83 (0.18, 3.7)	1.1 (0.53, 2.6)	1
Anemia:			
No	66 (88.0)	308 (96.0)	380 (92.7)
Yes	9 (12.0)	13 (4.0)	30 (7.3)
OR (95% CI)	1.7 (0.78, 3.8)	0.53 (0.27, 1.0)	1
Induction of labor:			
No	53 (74.6)	178 (62.7)	245 (64.8)
Yes	18 (25.4)	106 (37.3)	133 (35.2)
OR (95% CI)	0.62 (0.35, 1.1)	1.0 (0.79, 1.5)	1
Use of epidural analgesia during labor:			
No	**62 (89.9)**	**251 (87.2)**	263 (71.5)
Yes	**7 (10.1)**	**37 (12.8)**	105 (28.5)
OR (95% CI)	**3.5 (1.5,7.9)**	**2.7 (1.7,4.0)**	1
Mode of delivery:			
Vaginal delivery	**53 (70.7)**	219 (68.2)	259 (63.2)
Cesarean section	**22 (29.3)**	102 (31.8)	151 (36.8)
OR (95% CI)	**0.71 (0.41, 0.2)**	0.79 (0.58, 1.0)	1
Postpartum hemorrhage:			
No	70 (93.3)	297 (92.5)	369 (90.0)
Yes	5 (6.7)	24 (7.5)	41 (10.0)
OR (95% CI)	0.64 (0.24, 1.6)	0.72 (0.43, 1.2)	1

-Analyzed through logistic regression

Table: 3 Adjusted multivariate model for pregnancy and delivery outcomes between pregnant women in three age groups

Variables	15-17 years old N=24 n (%)	18-19 years old N=131 n (%)	20-25 years old N=216 n (%)
Hypertensive disorders of pregnancy:			
No	21 (87.5)	123 (93.9)	202 (93.5)
Yes	3(12.5)	8 (6.1)	14 (6.5)
OR (95% CI)	3.8 (0.94,15.8)	0.98 (0.37, 2.5)	1
Anemia:			
No	21 (87.5)	124 (94.7)	197 (91.2)
Yes	3 (12.5)	7 (5.3)	19 (8.8)
OR (95% CI)	1.0 (0.22, 4.8)	0.59 (0.24, 1.4)	1
Induction of labor:			
No	18 (78.3)	75 (63.6)	124 (62.9)
Yes	5(21.7)	43 (36.4)	73 (37.1)
OR (95% CI)	0.35 (0.11,1.1)	0.98 (0.60, 1.5)	1
Mode of delivery:			
Vaginal delivery	17 (70.8)	95(72.5)	136 (63.0)
Cesarean section	7 (29.2)	36 (27.5)	80(37.0)
OR (95% CI)	0.75 (0.29, 1.9)	0.72 (0.44, 1.1)	1
Postpartum hemorrhage:			
No	23 (95.8)	116 (88.5)	200 (92.6)
Yes	1(4.2)	15 (11.5)	16 (7.4)
OR (95% CI)	0.62 (0.78, 4.9)	1.5 (0.74,3.3)	1

-Analyzed through logistic regression on 372 women with complete data, adjusted for pregnancy weight gain and BMI at booking

-GDM was not analyzed because of sparse data

Table: 4 Un-adjusted multivariate model for neonatal outcomes between pregnant women in three age groups

Variables	15-17 years old N=75 n (%)	18-19 years old N=321 n (%)	20-25 years old N=410 n (%)
Newborn's status:			
Alive	74 (98.7)	313 (97.8)	399 (97.8)
Stillborn	1 (1.3)	7 (2.2)	9 (2.2)
OR (95% CI)	0.59 (0.07, 4.7)	0.99 (0.36, 2.6)	1
Baby transferred to NICU:			
No	70 (94.6)	298 (94.3)	377 (93.3)
Yes	4 (5.4)	18 (5.7)	27 (6.7)
OR (95% CI)	0.79 (0.27,2.3)	0.84 (0.45, 1.5)	1
Birth weight of baby:			
< 2500 grams	10 (13.3)	45 (14.1)	56 (13.8)
≥ 2500 grams	65 (86.7)	275 (85.9)	351 (86.2)
OR (95% CI)	1.0 (0.50, 2.1)	0.97 (0.63, 1.4)	1
Neonatal Growth centile:			
≥ 10th centile	60 (80.0)	267 (83.2)	349 (85.1)
< 10th centile	15 (20.0)	54 (16.8)	61 (14.9)
OR (95% CI)	1.4 (0.76,2.6)	1.1 (0.77,1.7)	1
Perinatal morbidity:			
Any other	6(75.0)	17 (70.8)	31 (75.6)
Congenital anomaly	2 (25.0)	7 (29.2)	10 (24.4)
OR (95% CI)	1.0 (0.17, 5.9)	1.2 (0.41, 3.9)	1

-Analyzed through logistic regression