The Impact of Antenatal Care on Pregnancy Performance between Adolescent Girls and Older Women

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ABSTRACT

Objective: *To investigate pregnancy performance and newborn outcome between adolescents and older women receiving adequate and similar antenatal care.*

Methods: *Four hundred and twenty-five women attending the antenatal clinic at the University Hospital of the West Indies, Kingston, Jamaica, participated in a prospective study. Recruitment included women 19 years and younger (adolescents) and 20 years and older (older women). Anthropometric measurements of the women and their newborn were made. During the pregnancy, all admissions to hospital and the diagnoses were recorded. Neonatal admissions were also recorded.*

Result: *Three hundred and sixty-one women each (84.9%) delivered a live infant of which 175 (87.5%) women were less than 20 years old and comprised the adolescent group and 186 (82.7%) of these women were 20 years and older and comprised the women in the older age group. Thirty-nine (9.2%) had early pregnancy losses; twelve among the adolescents (6%) and twenty-seven (12%) among the older women ($p = 0.03$). There was one intrauterine death and one stillbirth in the adolescent group and two intrauterine deaths and no stillbirth in the older group. The attendance rate at the antenatal clinic for both groups was high throughout the study with each group having greater than 96% attendance. There were 53 (26.5%) admissions among the adolescent girls and 70 (31.1%) admissions among the older women. This was not statistically significant. There was a significant difference in the occurrence of urinary tract infections where 17% of the adolescents had a urinary tract infection compared to 1% of older women ($p < 0.0001$). There was a lower Caesarean section rate among the adolescent. No significant difference between the number of neonatal admissions for the two groups ($p = 0.19$) was seen.*

Conclusion: *This study showed that with similar and adequate antenatal care there were minimal differences in pregnancy performance between the two groups with only an increased rate of urinary tract infections and a lower rate of Caesarean section in the adolescents.*

Impacto del Cuidado Prenatal en el Desenvolvimiento del Embarazo Entre Niñas Adolescentes y Mujeres Mayores

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RESUMEN

Objetivo: *Investigar el desempeño del embarazo y el resultado neonatal entre adolescentes y mujeres mayores que reciben cuidado prenatal similar y adecuado.*

Métodos: *Cuatrocientos veinticinco mujeres que asistían a la clínica de atención prenatal en el Hospital Universitario de West Indies, Kingston, Jamaica, participaron en un estudio prospectivo. El reclutamiento incluyó mujeres de 19 años y más jóvenes (adolescentes) y 20 años y mayores (mujeres mayores). Se hicieron mediciones antropométricas de las mujeres y sus recién nacidos. Durante el embarazo, se registraron todos los ingresos al hospital y los diagnósticos. También se registraron los ingresos neonatales.*

Resultado: *Trescientos sesenta y uno mujeres (84.9%) dieron a luz a un infante vivo. De ellas, 175 (87.5%) eran menores de 20 años, incluido el grupo de adolescentes, en tanto que 186 (82.7%) tenían 20 años o más, y abarcaban las mujeres en el grupo etario de más edad. Treinta y nueve (9.2%)*

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*tuvieron pérdidas de embarazo tempranas – doce de entre las adolescentes (6%) y veintisiete (12%) de entre las mujeres mayores (*p = *0.03). Hubo una muerte intrauterina y un parto de mortinato en el grupo de adolescentes, dos muertes intrauterinas y ningún parto de mortinatos en el grupo de más edad. La tasa de asistencia a la clínica de atención prenatal para ambos grupos fue alta a lo largo del estudio, teniendo cada de grupo una asistencia superior al 96%. Hubo 53 (26.5%) ingresos entre las adolescentes y 70 (31.1%) ingresos entre las mujeres de más edad. Esto no fue estadísticamente significativo. Hubo una diferencia significativa en la ocurrencia de infecciones del tracto urinario, donde el 17% de las adolescentes tuvieron una infección del tracto urinario en comparación con el 1% de las mujeres mayores (*p < *0.0001). Hubo una proporción de cesáreas menor entre las adolescentes. No se observó diferencia significativa alguna entre el número de ingresos neonatales en los dos grupos (*p = *0.19).*

Conclusión: *Este estudio mostró que con atención prenatal similar y adecuada, se produjeron diferencias mínimas en cuanto al desenvolvimiento del embarazo entre los dos grupos, con sólo un aumento de infecciones del tracto urinario y una tasa más baja de cesáreas en las adolescentes.*

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INTRODUCTION

Many studies have shown that pregnancies in adolescent girls are at increased risk of adverse outcome such as preterm delivery and perinatal loss. These studies have reported that adolescent mothers are at increased risk of developing hypertensive disorders of pregnancy, they have an increased incidence of perinatal and infant mortality and their babies are low birthweight and tend to be small for gestational age (1–3). For these reasons, it is imperative for this group of high risk mothers to have appropriate and adequate antenatal care to enable early identification and management of risk factors associated with adverse outcome.

A few studies have shown that adolescent girls who receive early and adequate antenatal care have improved outcome in terms of the birthweight of their newborn and gestational age (4–6). If this is indeed so then improved antenatal care may decrease the poor perinatal outcome among adolescents. Decreasing the incidence of adolescent pregnancies would be another approach to improve perinatal outcome (7). However, although, recent studies have shown that there is a general decrease in adolescent pregnancy rates in developed countries only modest declines have been demonstrated in Latin America, sub-Saharan Africa and the Caribbean (8). Therefore, in these countries, different strategies must be adopted.

In Jamaica, the adolescent birth rate is 108 per 1000 women which is the highest in the Caribbean Region (9). With such high rates, it is imperative for Jamaica to develop programmes to monitor and manage these high risk pregnancies in an attempt to reduce adverse outcomes. Implementation of such programmes will require special facilities and clinics to manage such patients leading to an increased burden on the healthcare system.

Although the ideal solution would be to implement strategies that lead to a decrease in the incidence of adolescent pregnancies, until these can be developed, it is important to determine factors that will decrease morbidity and mortality in such pregnancies. The purpose of this study was to compare outcomes between adolescent and older pregnant women in a cohort receiving early and adequate prenatal care and determine whether like previous studies by Felice *et al* (4), Neeson *et al* (5) and Morris *et al* (6) improved antenatal care improves outcome in adolescent pregnancies. A prospective study was therefore conducted to examine the pregnancy performance and the newborn outcome of a group of adolescent girls compared with older women attending the antenatal clinic at the University Hospital of the West Indies. We hypothesized that with early adequate antenatal care pregnancy performance and newborn outcome should be the same. The antenatal clinic at the University Hospital of the West Indies is well developed and structured and has been in existence for 50 years and provides quality care for the pregnant woman.

SUBJECTS AND METHODS

Four hundred and twenty-five women making their first visit to the antenatal clinic at the University Hospital of the West Indies, Kingston, Jamaica, between April 2003 and July 2004 were informed of the study and agreed to participate in this prospective study. The women were selected consecutively. Less than one per cent of the women invited declined to participate in this study.

Women 19 years and younger were referred to as the adolescent girls and women twenty years and older were referred to as the older women. Once written consent was obtained, a questionnaire was administered to the women; information on demographics, socio-economic status and menstrual details were obtained. Maternal weight and height were measured at the first antenatal visit and blood pressure and urine analysis were recorded from the antenatal records. Maternal weight was measured to the nearest 0.01 kg using a Tanita digital scale (CMS Weighing equipment Ltd, London, UK) and height to the nearest 0.1 cm using a stadiometer (CMS Weighing equipment Ltd, London, UK). A socio-economic score was calculated using education, occupation and household possessions of the mothers.

A woman was included in the study if her first antenatal visit was at a gestational age of less than or equal to fifteen weeks and she had no systemic illness such as hyper-

tension, diabetes mellitus or genetic disease such as sickle cell disease. The reason for the inclusion criterion of gestational age was that previous studies have shown that the weight of the mother in a pregnancy less than or equal to fifteen weeks is similar to that of her pre-pregnancy weight as she would not have gained a significant amount of weight in that time (10). The birthweight of the infants born to women who had their first antenatal visit later than fifteen weeks was also recorded. This was to investigate if timing of the first antenatal visit in adolescents influenced birthweight.

Mothers who had their first antenatal visit later than fifteen weeks gestation were all in the adolescent group (n = 67) as this group was seen as a high risk group and hence allowed to join the antenatal clinic at this institution despite the policy of the hospital that the first visit to the antenatal clinic should be at eight to ten weeks gestation. Older women were not allowed to join the antenatal clinic and were referred to other hospitals. These adolescents were not included in the study cohort; however the birthweight of the newborns of these adolescents was analyzed to investigate if birthweight differed from that of the newborns of the adolescent study cohort.

During the pregnancy, any admissions to hospital were noted and the diagnoses recorded. Birth measurements were made within 24 hours of delivery. Birthweight was measured to the nearest 0.01 kg using a Tanita model 1583 digital baby scale (CMS Weighing equipment Ltd, London, UK), crown-heel length was measured to the nearest 0.1 cm using a Harpenden infanometer (CMS Weighing equipment Ltd, London, UK) and head circumference was measured using a fiberglass tape measure. Measurements were done on 10 subjects prior to commencement of the study to assess the reliability of measurements within and between the two trained investigators who performed all measurements during the study.

Gestational age was determined by the last menstrual period and confirmed by ultrasound measurements done at approximately 15 weeks gestation. Ethical approval was obtained from the Medical Ethics Committee of the University of the West Indies/ University Hospital of the West Indies.

Data were expressed as means ± SD. Using the independent Student's t-test, differences between the two groups were identified. The chi-square test was done to determine differences between categorical variables. Categorical variables were expressed as a proportion. Correction for multiple testing was performed using the Bonferroni's method. Analyses were performed using the Statistical Programme for Social Sciences (SPSS) version 11.0.

RESULTS

Four hundred and twenty-five women were recruited to the study and 361 women (84.9%) delivered live infants at the University Hospital of the West Indies of which 175 (87.5%) of the women were less than 20 years old and comprised the adolescent group and 186 (82.7%) of these women were greater than 20 years old and comprised the women in the older age group. Thirty-nine (9.2%) had early pregnancy losses: twelve among the adolescents (6%) and twenty-seven (12%) among the older women ($p = 0.03$). There were one intrauterine death and one stillbirth in the adolescent group and two intrauterine deaths and no stillbirths in the older group. Seventeen women (4%) were lost to follow-up from the study for various reasons (migration, transferred to another antenatal clinic due to cost); there were eight (4%) in the adolescent group and nine (4%) in the older group. There were two twin pregnancies (0.5%) both occurring in the adolescent group and two (0.5%) women one in each group who booked later than 15 weeks (confirmed by an early ultrasound) who were not included in the study Table 1. The women in the study were of similar socio-economic background.

Table 1: Recruitment of study subjects

	Adolescents # 19 years	**Women $ 20 years**
Live infants delivered	175	186
Early pregnancy losses	12	27
Lost to follow-up	8	9
Intrauterine death	1	2
Stillbirth	1	0
Twin gestation	2	0
Gestational age > 15 weeks	1	1
Total	**200**	**225**

The attendance rate at the antenatal clinic for both groups was high throughout the study with each group having greater than 96% attendance (compliant with all predefined antenatal appointments). Both groups were exposed to similar numbers of antenatal visits; eight to nine per pregnancy. The mean age of the adolescent girls was 17.7 ± 1.3 years and the mean age of the older women 28.7 ± 5.6 years at the first antenatal visit. There was a significant difference seen in the anthropometry between the adolescent group where the younger women had smaller measurements compared to the older women (Table 2). There was a significant difference seen in the gestational age at the first antenatal visit ($p < 0.0001$) where the adolescent girls, although registering early, were one week more advanced in their pregnancy than the older women. These differences remained statistically significant even after correction for multiple testing was performed using the Bonferroni's method. There was however no difference seen between the newborns of either group although the adolescent mothers had smaller placental weights (Table 2). There were no significant differences seen in the pregnancy performance of the two groups of women except for the mode of delivery where older women had significantly more operative deliveries (Table 3).

There were 67 adolescents who delivered at this institution who had their first antenatal visit later than fifteen

Table 2: Maternal measurements at the first antenatal visit and newborn characteristic of adolescent girls and older women

Maternal Variables	Adolescent Girls n = 200 Mean ± SD	Older Women n = 225 Mean ± SD	*p*	Adjusted *p*
Age (year)	17.7 ± 1.3	28.7 ± 5.6	–	
Weight (kg)	60.7 ± 12.4	70.01 ± 14.13	< 0.0001	0.0033
Height (cm)	162.7 ± 5.9	164.03 ± 5.79	0.017	0.561
BMI (kg/m^2)	22.9 ± 4.4	25.95 ± 4.87	< 0.0001	0.0033
Systolic blood pressure (mmHg)	108.8 ± 12.8	109.87 ± 13.64	0.40	1.0
Diastolic blood pressure (mmHg)	65.8 ± 7.6	69.40 ± 8.53	< 0.0001	0.0033
Gestational age (weeks)	11.5 ± 3.0	10.0 ± 1.9	< 0.0001	0.0033
Socio-economic status score	34.0 ± 4.3	33.7 ± 2.8	0.35	1.0
Neonatal Variables	**n = 175**	**n = 186**		
Birthweight (kg)	3.04 ± 0.54	3.01 ± 0.47	0.43	1.0
Head circumference (cm)	34.2 ± 1.8	34.1 ± 1.5	0.98	1.0
Crown-heel length (cm)	48.9 ± 2.4	48.9 ± 2.3	0.92	1.0
Ponderal index (kg/m^2)	26.0 ± 2.9	25.7 ± 2.6	0.26	1.0
Placental weight (g)	589 ± 113	618 ± 137	0.03	1.0
Gestational age (days)	39.0 ± 2.1	38.9 ± 2.1	0.80	1.0

Table 3: Pregnancy outcome between adolescent girls and older women

Mode of delivery	Adolescent girls n (%)	Older women n (%)	*p*
Vaginal delivery	148 (84.6)	139 (74.7)	
Caesarian	27 (15.4)	47 (25.3)	
Total	175 (100)	186 (100)	0.03
Outcome of Baby			
Low Birthweight	20 (11.4)	23 (12.4)	0.70*
Small for gestational age	4 (2.9)	3 (1.6)	0.30*
Prematurity	19 (10.9)	16 (8.1)	0.61*

Low birthweight is a birthweight less than 2.5 kg

Small-for-gestational age is when the birthweight is less than the 10th centile for gestational age

Prematurity refers to birth occurring less than 37 completed weeks gestation or less than 259 days

* Fisher's exact test

weeks gestation and hence were not included in the study cohort. This group of adolescents delivered infants with a mean birthweight of 2.77 ± 0.8 kg which was 230 g less than the adolescents who were in the study cohort (p = 0.006).

There were 53 (26.5%) admissions among the adolescent girls and 70 (31.1%) admissions among the older women but this was not statistically significantly different. For these admissions, there were 74 and 77 different reasons for the adolescent and older women respectively as there were multiple diagnoses for some admissions. There were no significant differences detected in the major complications seen in pregnancy between the adolescents and the older women except that there was a higher incidence of involvement of the urinary tract system in the adolescents, where 13 (17%) of the adolescents had a urinary tract infection compared to one (1%) of the older women (Table 4). This difference in the incidence of urinary tract infections was real as the women were all treated similarly and received similar antenatal

Table 4: Maternal reasons for hospital admissions

Reasons for Admission	Adolescent girls n = 53		Older women n = 70		Fisher's exact test	Adjusted
	n	%	n	%	p	p
Pregnancy induce hypertension	10	14	9	12	0.65	1.0
Pre-eclampsia	2	3	7	9	0.18	1.0
Induce labour	16	22	20	26	0.74	1.0
Post dates	4	5	7	9	0.55	1.0
Cesearean section	3	4	8	10	0.23	1.0
Premature labour	7	9	7	9	1.0	1.0
Urinary tract infection	13	17	1	1	< 0.0001	0.0033
Poor weight gain	2	3	5	7	0.46	1.0
Others	17	23	13	17		
Total	**74***	**77***				

*The number of diagnoses exceeds admissions because of multiple diagnoses for some admissions.

care with no more test conducted among the adolescents compared to the older women. The length of labour in hours was 8.2 ± 3.8 in the adolescent group and 7.3 ± 4.4 in the older women ($p = 0.07$).

Fifteen per cent of newborns (27/175) born to the adolescent girls and 21% (39/186) of newborns born to older women were admitted to the Newborn Special Care Unit. There was no significant difference between the number of admissions for the two groups ($p = 0.19$). There were 39 and 52 different reasons for newborn admissions for adolescents and older women respectively as there were multiple diagnoses for some admissions. The most common reasons for newborn admissions were neonatal jaundice and presumed sepsis (Table 5).

Table 5: Reasons for neonatal hospital admissions for adolescent girls and older women

Reasons for admission	Adolescent girls n = 27		Older women n = 39		Fisher's exact test
	n	%	n	%	*p*
Jaundice	11	28	6	12	0.15
Presumed sepsis	9	23	16	31	0.30
Meconium aspiration syndrome	1	3	3	6	0.63
Prematurity	2	5	7	14	0.18
Respiratory distress	6	15	5	10	0.76
Asphyxia	0	0	3	6	0.25
Low birthweight	0	0	4	8	0.13
Others	10	26	8	15	
Total	**39***		**52***		

*The number of diagnoses exceeds admissions because of multiple diagnoses for some admissions

In order to determine the contribution that maternal age had on the birthweight of the infant, the women were divided into age categories. The 17–19-year age group had the greatest number of women while the 14–16-year age group had the smallest number of participants. In this analysis, there was no significant difference found in birthweight between the groups (Table 6).

Table 6: Mean birthweight (kg) according to maternal age (years) in groups

Maternal Age Groups (years)	Mean Birthweight* ± SD	n
14–16	3.11 ± 0.38	29
17–19	2.98 ± 0.48	146
20–25	2.95 ± 0.53	64
25–30	3.04 ±0.59	61
> 30	3.14 ± 0.49	61
Total	**3.02 ± 0.51**	**361**

*$p = 0.165$

DISCUSSION

This study showed that there was no significant difference between adolescent girls and mature women in the occurrence of adverse outcome in pregnancy once they experienced adequate and similar antenatal care. Less than one per cent of the women approached declined to participate in the study and hence these small numbers would not have created a selection bias. The younger women had lower weight and BMI at the first antenatal visit which is usually a predictor of poor birth outcome. This difference in weight however did not impact negatively on outcome in this study.

The younger women in this study appeared to be motivated as they attended their first antenatal visit at an early gestational age of eleven weeks although it was at a later gestational age than the older women. This early age at the first antenatal visit of eleven weeks gestation is in contrast to other studies which have shown that adolescent mothers tend to seek antenatal care later (15–19 weeks) as the adolescents attempt to conceal their pregnancy (11). It is recognized that exposure to early ultrasound in pregnancy leads to bonding with the unborn child. Mothers who have early ultrasound tend to be highly motivated to ensure that their infant is healthy (12, 13). If these women smoked or drank alcohol they would tend to abstain from these practices for at least the period of the pregnancy; these women would also pay more attention to their dietary habits (13). All the women in the study had an early ultrasound to confirm their dates and it is possible that this may have influenced the high antenatal clinic attendance rate noted in this study and contributed to the positive outcome.

The group of adolescents who had their first antenatal visit later than fifteen weeks gestation could not be compared to the older women who had their first antenatal visit at greater than fifteen weeks gestation as the older women were not allowed to join the clinic before that period of gestation. Since we do not have a mature group to compare with, we cannot determine whether the smaller size of the newborn of the adolescents who had their first antenatal visit greater than fifteen weeks gestation is related to poor compliance and health-seeking behaviour. However, what has been clearly shown is that in this subgroup of adolescents their infants were significantly smaller.

The total number of hospital admissions between the two groups who had their first antenatal visit less than fifteen weeks gestation was not significantly different. However, a diagnosis of a urinary tract infection was made significantly more often in the adolescents compared to the older women. Jolly *et al* also describe a higher rate of urinary tract infections in adolescent girls and this was associated with preterm birth (14). Although we found an increased rate of urinary tract infections, we noted no difference in the rate of preterm deliveries between the two groups in this study. It is possible that the younger woman's genitourinary system is immature and unable to cope with the stress of a pregnancy and this predisposes her to increased infection. This hypothesis of increased infection in the adolescent has also been suggested by Jolly *et al* (14) and is an area for further study to determine if there is a true association. The number of admissions of the neonates for the older women was slightly greater that the younger women but this was not significant.

It is probable that adolescents are still within their growth phase and possess some biologic immaturity. General features of biologic immaturity such as a young gynaecologic age defined as conception within two years of menarche (15) and a girl becoming pregnant before her own growth ceases (16–18) has been thought to have a negative impact on pregnancy outcome. Conde-Agudelo *et al* suggested that if this theory of biologic immaturity accounted for the greatest proportion of delivery complications we would have expected a higher Caesarean section rate among this population (8). However, this was not substantiated in their study and in fact they showed a decrease in the incidence of Caesarean deliveries in this age group, a similar finding to this study. The reasons for this decrease incidence are unclear. It was noted in this study that there was a greater number of mature women who experienced hypertensive disorders of pregnancy but this finding was not statistically significant and therefore cannot explain the higher Caesarean section rate in the older women.

Previous studies have documented that younger women have an increased incidence of low birthweight and prematurity (2, 3, 14, 19). This is contradictory to what was observed in this study. It has been suggested that immaturity of the uterine and cervical blood supply may predispose adolescents to subclinical infections and consequently give rise to increased prostaglandin production and an increased incidence of preterm deliveries (17, 18). Also as these young mothers continue to grow they compete with the developing fetus for nutrition to the detriment of the fetus resulting in infants of lower birthweight (20). Many authors have found an association between low birthweight and younger maternal age (3, 19, 21). This was not observed in our adolescent population and the positive outcome in this study can be possibly attributed to the quality of antenatal care received.

If indeed this improved pregnancy performance among the younger women is due to early and adequate antenatal care then it follows that all adolescent girls should be encouraged to seek early and appropriate antenatal care to decrease the morbidity and mortality associated with pregnancy as previously reported. Chang *et al* have shown that there is a relationship between inadequate prenatal care and an increase rate of preterm birth (3). In this study, the high rate of antenatal care experienced in each group suggests that the similar pregnancy performance between the mature women and the adolescent girls may in fact be linked to adequate antenatal care and this adequacy of care has a positive effect on pregnancy outcome in adolescent girls. Findings by Scholl *et al* and Fraser *et al* also support this as they have shown a strong association between inadequate prenatal care and adverse outcomes (1, 19). This study therefore concurs with studies which suggest that improved antenatal care may improve outcome in the adolescents.

Once adolescent mothers receive early and adequate antenatal care there appears to have better pregnancy performance with a decrease in the incidence of preterm delivery and the incidence of low birthweight infants. This suggests that a simple cost effective intervention for developing countries to decrease the mortality and morbidity associated with adolescence pregnancies may be to ensure adequate antenatal care.

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