ORIGINAL ARTICLE

SONOGRAPHIC ASSESSMENT OF THE EFFECT OF PARITY ON FETAL WELL-BEING IN SINGLETON PREGNANCIES; EXPERIENCE IN UNIVERSITY OF CALABAR TEACHING HOSPITAL

Running Title

Impact of Parity on the fetus

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ABSTRACT

Background

Adverse pregnancy and perinatal outcomes are still very high in developing countries. Parity is considered an important influence on the health outcome of the fetus and mother during subsequent pregnancies. This study was aimed at determining the association between parity and feto-maternal wellbeing among singleton pregnant women.

Methods

This prospective cross-sectional study included 100 singleton pregnant women below 40 years of age with between 20 to 40 weeks gestation. It was conducted at the Radiology Department of the University of Calabar Teaching Hospital, Calabar from March 2021 to June 2021. Obstetric ultrasound procedure was done on all the pregnant women. The collected data were analyzed using SPSS version 20 statistical package.

Result

There was a significant positive correlation between parity and estimated fetal weight (P = 0.036). Increase in the maternal parity was associated with a proportional increase in the mean estimated fetal weight and this successive increment was statistically significant (P = 0.024). Maternal age had a significant positive correlation with parity (P = 0.000). The maternal diastolic blood pressure increased marginally as parity increased but it was not statistically significant (P = 0.318).

Conclusion

The study provides evidence that increasing parity is strongly associated with an increase in the fetal weight of the subsequent pregnancy and also increases the likelihood of macrosomia especially when the maternal age increases.

Key words

Parity, Fetal weight, Maternal age, Pregnant women

Introduction

Pregnancy is generally regarded as a normal experience in a woman's life. In spite of that, many studies have documented the myriad deleterious effects of pregnancy which culminates to a decrease in women's quality of life. Quality of life is a multi-factorial concept which encompasses physical, psychological and social health. Parity is one of the factors that affect women's health and may be involved in the processes that lead to abnormal fetal growth. [1]

Abnormal fetal growth in-utero is of significant public health concern because it has negative repercussions on the mother and the new born such as perinatal morbidities, neurological

damage, respiratory diseases, hearing and visual problems and learning disabilities. Evidence have shown that intrauterine fetal growth anomalies are major contributors of later life morbidities like stunted growth, mental retardation, cerebral palsy and under- five mortality. [2, 3]

High parity is defined as having ≥5 pregnancies. It is one of the diverse risk factors which have been postulated to influence the mechanisms that culminate to fetal growth abnormalities. Studies to discover the exact adverse consequences on the outcome of fetal growth due to increasing parity has been inconsistent. The results of some researchers indicated that high parity or increasing parity is responsible for low fetal weight and premature deliveries while others revealed that there was no relationship between them, or an increased frequency of macrosomia with high parity. [4, 5]

The implications of increased parity or high parity on subsequent pregnancies has not been properly investigated in this locality. The findings of this research will also be a useful tool for health professionals to utilize in family planning education especially on the needs and concerns of high parity women in pregnancy. The aim of this study was to investigate the associations between parity and feto-maternal wellbeing among singleton pregnant women.

Methodology

The research was an Institution-based, prospective, cross-sectional study which was conducted in the Radiology Department of the University of Calabar Teaching Hospital, Calabar, Nigeria from March 2021 to June 2021. The study population was obtained from the pregnant women who attended the antenatal clinic of the Obstetrics and Gynecology Department of the University of Calabar Teaching Hospital, Calabar, Nigeria, during the period of the study. The protocol for this study was approved by the health research ethics committee of the University of Calabar Teaching Hospital. Purposive sampling technique was employed for the research.

The participants of this study were 100 consenting singleton pregnant women below 40 years of age with pregnancies between 20 weeks and 40 weeks gestation. Every woman had to fill the written informed consent form before data collection commenced. Women with placenta praevia, multiple gestation, hypertension in pregnancy, pre- and gestational diabetes, congenital anomaly, human immunodeficiency virus (HIV) and sickle cell disease were excluded from the study.

The history was obtained from the consenting women where information on socio-demographic data, obstetric and medical history were collected and recorded. General physical examination (including the measurement of the participant's height and weight) and blood pressure assessment were conducted on all the participants of the study. The body mass index (BMI) was calculated by dividing the maternal weight by the square of the maternal height (kg/m^2).

Routine obstetric ultrasound scan was done on the pregnant women using standardized procedures to obtain the estimated gestational age (EGA), estimated fetal weight (EFW), fetal heart rate (FHR) and the placental thickness (PLA) to the nearest millimeters. [6, 7, 8] The ultrasound machine that was utilized for the procedure was an Aloka prosound SSD-3500sx (2-Dimensional with Doppler facility) that has a curvilinear probe with a frequency range of 3.5 – 5 MHz (manufactured in 2008 by Aloka company limited located in Meerbusch, Germany). The obstetric ultrasound scan for all the women was done by an experienced Radiologist. Parity was defined as a pregnancy that was carried to term and delivered successfully. [C] Macrosomia was defined as fetal weight equal to and above 4.00 kg. [2, 4]

All the statistical analysis was done using SPSS version 20.0 (SPSS Inc., Chicago, IL). Appropriate tables and charts were the means used to display the results where continuous variables were summarized using means, standard deviation, median and range. The relationship of parity with other variables was determined by pearson correlation while the one-way analysis of variance (ANOVA) was used to determine differences among the means of the variables and P value < 0.05 was considered statistically significant in both instances.

Results

A total of 100 women were included in this study and their age range was from 20 to 39 years with a median of 30 years. Table 1 shows that the pregnant women had a parity of 0 (nulliparous women) to a parity of 4 with a median of 1. Most of the women (46%) had tertiary education, were employed (76%) and their mean body mass index (BMI) was in the over-weight category (29.15±4.21 kg/m^2). The maximum fetal weight in the study was 4.10 kg and the mean value of estimated fetal weight (EFW) was 2.13±1.02 kg. The mean placental thickness (32.31±5.47 mm) was nearly similar to the mean estimated gestational age (32.64±5.52 weeks).

TABLE I:
SOCIO-DEMOGRAPHIC AND FETO-MATERNAL VARIABLES

	Frequency (n)	Minimum	Maximum	Mean	Median
EGA (weeks)	100	20.00	40.29	32.64±5.52	34.57
EFW (kg)	100	0.35	4.10	2.13±1.02	2.31
PLA (mm)	100	19.80	39.80	32.31±5.47	34.30
FHR (beats/min)	100	122	158	141.25±8.33	141.50
Parity	100	0.00	4.00	0.99±0.959	1.00
AGE (years)	100	20.00	39.00	29.86±4.32	30.00
BMI (kg/m^2)	100	20.50	39.70	29.15±4.21	29.05
SYS BP (mmHg)	100	90	130	112.40±8.78	110.00
DIA BP (mmHg)	100	60	80	65.08±6.55	60.00
Educational qualification					
Primary	33	-	-	-	-
Secondary	21	-	-	-	-
Tertiary	46	-	-	-	-
Employment status					
Employed	76	-	-	-	-
Unemployed	24	-	-	-	-

EGA – Estimated gestational age, EFW – Estimated fetal weight, PLA – Placental thickness, FHR – Fetal heart rate, BMI – Body mass index, SYS BP – Systolic blood pressure, DIA BP – Diastolic blood pressure

Figure 1 shows that women with parity 1 made up two-fifths of the participants in this study while parity 4 women were the least and only accounted for 2%. The nulliparous (women with parity 0) made up 35% of the participants, which was the second highest parity frequency. The women with parity 3 made up 18% of the participants.

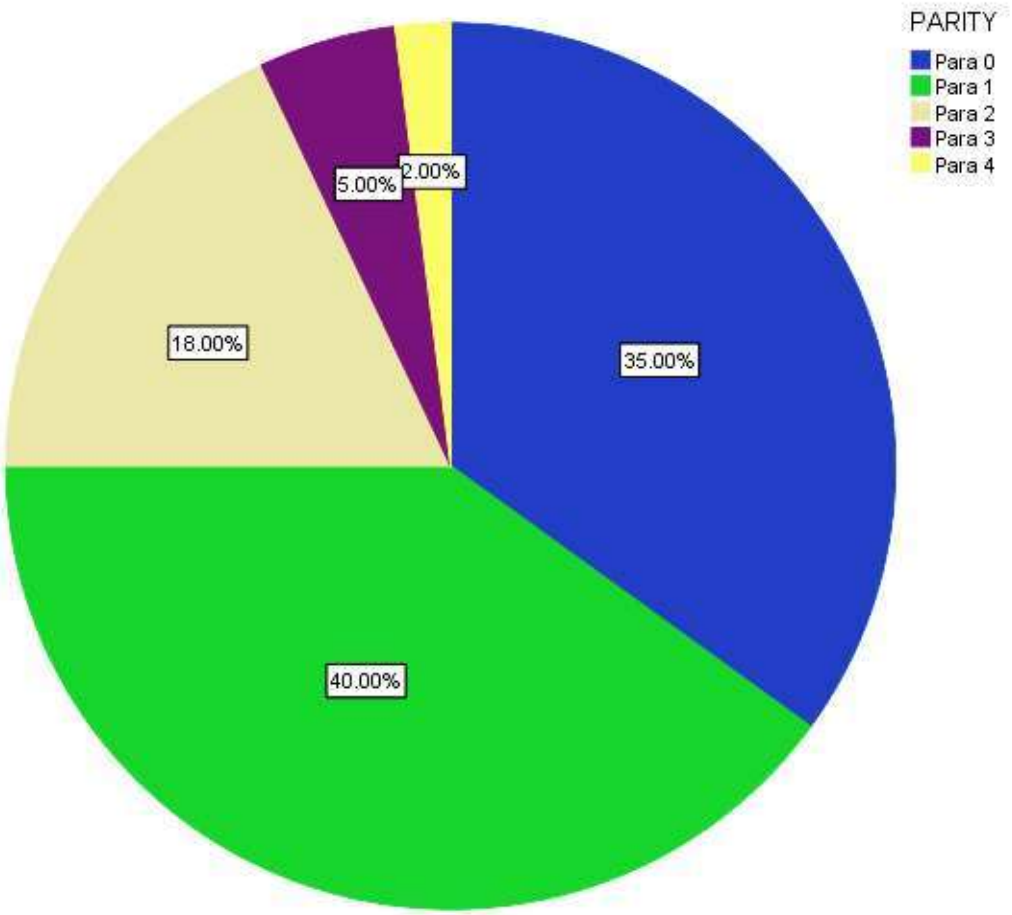

Figure 1: Frequency of parity

As indicated in Table 2, when parity increased the estimated fetal weight also increased and it was highest at parity 4. However, there was a reduction at parity 3. The association between parity and estimated fetal weight was significant (P = 0.024). Age also increased as parity increased and this was significant as well (P = 0.000). Fetal heart rate, placental thickness, BMI and systolic blood pressure were all observed to have non-consistent increments in their values as parity increased, unlike the diastolic blood pressure that increased in consistent small margins with parity, nevertheless, the differences in the groups were not statistically significant.

Table II:
Mean values of variables with respect to maternal parity

VARIABLES	Parity					P VALUE	
	0	1	2	3	4	P value[1]	P value[2]
EGA (weeks)	31.83±5.41	32.15±6.02	35.21±3.86	30.63±5.22	38.72±2.23	0.086	0.083
EFW (kg)	1.94±0.98	2.06±1.08	2.60±0.80	1.70±0.72	3.70±0.57	0.024*	0.036*
PLA (mm)	31.41±5.43	31.87±5.93	34.80±3.70	30.64±5.14	38.55±1.77	0.087	0.062
FHR (beats/min)	140.09±6.95	141.20±9.69	142.78±7.80	145.20±7.95	139.00±9.90	0.642	0.238
BMI (kg/m^2)	28.62±4.26	29.53±3.90	28.97±4.57	29.30±4.53	32.15±8.70	0.755	0.391
SYS BP (mmHg)	112.57±9.19	112.75±8.16	110.56±9.98	112.00±8.37	120.00±0.00	0.674	0.977
DIA BP (mmHg)	64.23±6.41	64.75±5.54	65.56±7.05	70.00±10.00	70.00±14.14	0.318	0.060
AGE (years)	26.89±3.50	30.30±3.37	32.94±4.21	34.20±3.63	34.50±2.12	0.000*	0.000*

(*) – P value < 0.05 is significant, P value [1] – ANOVA, P value [2] – Pearson correlation, EGA – Estimated gestational age, EFW – Estimated fetal weight, PLA – Placental thickness, FHR – Fetal heart rate, BMI – Body mass index, SYS BP – Systolic blood pressure, DIA BP – Diastolic blood pressure

Table 3 shows that only women with parity 0 and parity 1 were in the 20 -24 years age group, and parity 0 was predominant (81.82%). In the 25 – 29 years age group majority of the women also had parity 0 (48.65%) while those with parity 1 made up 35.14% and parity 2 made up 13.51%. More than half of the women in the 30 – 34 years age group had parity 1 (57.14%) while the women with parity 4 were the least consisting of 2.86% of the group. Women with parity 4 were also the least in the 35 – 39 years age group (6.25%) but majority of the women, in this age group had parity 2 (43.75%).

Table III:
Frequency distribution of parity in the different age groups

Age	Parity	Frequency (n, %)
20 – 24 years	0	9 (81.82%)
	1	2 (18.18%)
	2	0 (0%)
	3	0 (0%)
	4	0 (0%)
		11 (100%)
25 – 29 years	0	18 (48.65%)
	1	13 (35.14%)
	2	5 (13.51%)
	3	1 (2.70%)
	4	0 (0%)
		37 (100%)
30 – 34 years	0	8 (22.86%)
	1	20 (57.14%)
	2	5 (14.29%)
	3	1 (2.86%)
	4	1 (2.86%)
		35 (100%)
35 – 39 years	0	0 (0%)
	1	5 (31.25%)
	2	7 (43.75%)
	3	3 (18.75%)
	4	1 (6.25%)
		16 (100%)

Discussion

Appropriate fetal weight is an indispensable factor that determines fetal survival in-utero, neonatal well-being and the health status of a growing child. [9] In this study it was demonstrated that increment in the weight of the fetus as the parity increased was significant (P = 0.024). In addition, there was a significant positive correlation between parity and estimated fetal weight in this study (r = 0.210, P = 0.036). We can deduce from this study that pregnant women with higher parity tend to have fetuses whose weights are greater than that of women with similar gestational ages and as the parity increases so does the fetal weight. In alignment with the findings of this study, Gaillard et al. [6] in Netherlands, observed that fetal weight increased in a linear trend as the parity of the pregnant women increased especially in the third trimester (P<0.01). [6] This was corroborated by Lin et al. [3] in China, who found that multiparous women had reduced risks of having a baby with low fetal weight (RR=0.89, 95% CI:0.86-0.91) than nulliparous mothers. Ong et al. [10] in the United Kingdom, also in consonance with our results, observed that fetal weight uniformly increased as the parity increased but the children from mothers with lower parity or primiparous usually catch-up in weight and height in a dramatic manner as they grow up.

They suggested that since the uterine structure was shorter and smaller in nulliparous compared to multiparous and there was associated reduction in the uterine arterial blood flow in the former, the physiological changes of the previous pregnancies in multiparous afforded favourable conditions for placental development, placental function and fetal nutrition, which are the basis for appropriate growth of subsequent fetuses. [3, 6] Moreover, the association between higher parity and hyperglycemia also proffers an explanation to the inclination of having fetuses with higher weight as the parity rises. [11]

In contrast to the findings of this study, Bekele et al. [5] in Ethiopia, observed that there was a reduction in the mean fetal weight as the parity increased, and this was remarkable from parity 2 to parity 5 and above. They further stated that nulliparous and primiparous women had no risk of having low fetal weight when pregnant compared to multiparous women. Rasyid et al. [12] in Indonesia, opined that high parity pregnancy occurs in a uterus that had been repeatedly stretched which inevitably causes a deterioration of the uterine tissue elasticity. This culminates in abnormal placental attachment that subsequently impairs fetal growth.

The maximum fetal weight recorded in this study was 4.10 kg in a pregnant woman with parity 4 which buttresses the postulation that high parity women or multiparous women have a high likelihood of having a macrosomic baby. Dasa et al. [13] in Ethiopia, in congruence with our study inferred that the risk of macrosomia was higher in grand multiparity than in low multiparity (aRR = 1.6; 95% CI: 1.23–2.07).

Gaillard et al [6] in Netherlands lucidly noted that among the pregnant women, those with high parity were associated with a higher risk of large-for-gestational age babies (P<0.05) which was similar to our result. In addition, Al-Farsi et al [4] in a research done in Oman, observed that there were more cases of macrosomia among the group with high parity than in low parity but the difference was not significant (P=0.61). Similarly, Genc et al. [2] in Turkey, whose study was exclusively on pregnant women aged 40 years and above, noticed that the fetal weight of primiparous was lower than that of multiparous 2927.69±715.44 gm vs 3158.21±669.02 gm, and the difference was significant (P = 0.019).

Incongruous with our findings, Yimer et al. [14] in Ethiopia, demonstrated that the likelihood for macrosomia was higher in low multiparous (parity 2 – 4) than grand multiparous (57.38%). The mean fetal weight of low multiparous women was 3214.98±564.60 gm, which was higher than that of grand multiparous women (2994.80±601.87 gm). The trio of Chan et al. [15] in Hong Kong, Ugwuja et al. [16] in Nigeria and Tiwari et al. [9] in India all inferred that there was no significant statistical correlation between fetal weight and parity.

Merklinger-Gruchala et al. [17] in Poland, interestingly illuminated a nascent perspective of evaluating the relationship that parity has with subsequently pregnancies when they propounded that the absence of paternal investment was strongly associated with low fetal weight in multiparous mothers (P = 0.02) than in primiparous mothers (P = 0.24). They opined that the unfavourable environment created when a father provides little or no support and the existing children are still in need of attention and care make women to employ a reproductive adaptation

and plan which results in lower investment in the current pregnancy and this is expressed in reduced fetal growth and subsequently, low fetal weight. [17] Evidence from several studies have shown that the impact of a partner's support is more beneficial to the wellbeing of pregnant women and her offspring than the role of any other member of a woman's social network. [17] However, since no data on marital status and co-inhabitation during the current pregnancy was obtained from the pregnant women in this study there was no basis to relate our findings with the impact of paternal investment.

The maternal age of the pregnant women was observed to increase in a linear fashion with parity and the relationship between them was statistically significant (r = 0.563, P = 0.000). Women who had high parity (parity 3 and 4) were mostly seen in the 35 to 39 years age group but completely absent in the 20 to 24 years age group while at the other end of the spectrum, nulliparous women were predominant in the 20 to 24 years age group but none was observed in the 35 to 39 years age group and this seems to be the premise on which the relationship was based. In consonance with this study, Gaillard et al. [6] in Netherlands, noticed that parity increased as the maternal age increased and there was a significant association between them (P<0.01). Al-Farsi et al. [4] also realized that high parity was associated with older age. It is important to understand the factors that are responsible for the motivation of reproductive decisions. Firstly, several couples tend to agree on their desired family size early or before marriage, however, educational pursuit and economic constraints might delay its attainment and also the survival of previous children. They might be pressurized afterwards to still meet up with the desired number of children. These elements contribute to synchronously drive up the maternal age and parity. [18]

Genc et al. [2] found out that gestational hypertension was most common in primiparous than other groups of parity and accounted for 15.4% and its occurrence was significant in this group (P = 0.001). Chan et al. [15] in Hong Kong, likewise realized that primiparous women had a higher incidence of hypertensive disorders than multiparous and the difference was statistically significance (P = 0.015). Interestingly, Gaillard et al. [6] in Netherlands found out that the incidence of gestational hypertension was higher in nulliparous women but declined afterwards until parity 2 and from parity 3 the incidence rises. In this study we observed that the diastolic blood pressure of the pregnant women rose gradually as the parity increased successively by one. However, this uniform increment in the diastolic blood pressure was not accompanied by a similar rise in the systolic blood pressure. In addition, there was no statistically significant relationship between diastolic blood pressure and parity in this study (P = 0.060).

Adeniran et al. [8] realized that the mean placental weight increased in direct proportion with the parity of pregnant women. Placentas of multiparous women of 32 weeks gestational age and beyond have been found to be heavier than those from primiparous women. Some literatures have lucidly reported a rise in placental weight with the parity of a woman until the sixth delivery after which it is expected to start declining.

The integrity of the placenta is a major influence with regards to the evaluation of fetal growth and in this study, it was seen to increase in thickness in direct proportion with the parity of the pregnant women. However, there was no statistically significant relationship between the increase in placental thickness as the parity increased (P = 0.087) and there was no significant relationship between placental thickness and parity (P = 0.062). In line with our findings, Njeze et al. [19] realized that there was no significant correlation between parity and placental thickness.

Nevertheless, the present study had several limitations. Firstly, this study was conducted at a single center whereas a multi-center study in this locality would have been beneficial. Secondly, there was a lack of data on marital status which could have provided the opportunity to explore its association with low fetal weight.

Conclusion

The study provides evidence that increasing parity is strongly associated with an increase in the fetal weight of the subsequent pregnancy and also increases the likelihood of macrosomia especially when the maternal age increases. An increase in parity does not affect the maternal blood pressure and body mass index.

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