

## Seasonality and other variation trends in birth weights of 4000g and above: A preliminary report from the University of Port Harcourt Teaching Hospital, Nigeria

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### ABSTRACT

**Background:** Anecdotal evidence appears to suggest a progressive increase in the proportion of large babies born at the University of Port Harcourt Teaching Hospital (UPTH), Nigeria. The objective of this study is to examine retrospectively the profile of birth weights at the UPTH over a defined time frame.

**Methods:** The birth weights of all babies born in the hospital from January 1, 1990 to December 31, 1999 were analyzed with the focus on weights =4000g. The ten-year period was elongated into 20 six-monthly observation points and the periodic fluctuations in the proportion of birth weights =4000g smoothed by using exponentially weighted moving averages with a weighting factor of 0.18. Seasonal variations in rates of birthweight =4000g were calculated using Ratchet Circular Scan Test for a short seasonal peak. Proportions were compared using chi-square statistic.

**Results:** Fourteen thousand three hundred and seven birth weights were recorded; 7111 males and 7196 females. Nine hundred and four (12.7%) and 434 (6.0%) of males and females respectively were 4000g and above. There was a sustained increase in the proportion of the =4000g category during the observation period although the slope was steeper among the males (slope with [95% Confidence Interval] for males = 0.4131 [0.3213 to 0.5050] and for females 0.1801 [0.05565 to 0.3045]. There was a significant 3-month peak August to October of males only of birth weight = 4000g, (3-month peak; August to October, 30.3% of events. Test Statistic 3.46,  $p < 0.005$ ).

**Conclusion:** There has been a steady increase in the proportion of babies of birth weight =4000g at the UPTH in the ten-year period studied. This trend could be potentially dangerous for both mother and baby; therefore the authors believe it would be a good idea to carry out a prospective investigation along similar lines but using a much broader study base.

**KEYWORDS:** Seasonality; variation trends; birthweight; Port Harcourt.

Paper accepted for publication 24th July 2006.

### INTRODUCTION

Anecdotal evidence appears to suggest an increase in the proportion of large babies born at the University of Port Harcourt Teaching Hospital particularly in the last five-year period from 1999. This observation caused some anxiety among staff of the Special Care Baby Unit because of an apparent increase in the number of babies admitted with both traumatic and asphyxial injuries. Studies on birth weights carried out in this hospital twenty years ago revealed that outside maternal diabetes, a major determinant of the size of babies at birth was maternal height. Tall mothers tended to give birth to babies with birth weights above the 90<sup>th</sup> percentile for the gestation<sup>1</sup>; in that report, 4.3% of the babies had a mean $\pm$  (1 standard deviation) of 4164.68 $\pm$ 879.59g and the birth weights were above the 90<sup>th</sup> percentile for the mean gestation of 40 weeks. However, in that report, the males and females were not separately analyzed<sup>1</sup>. In a separate report from the same hospital on singleton birth weights, 112 (7.2%) of 1561 males and 58 (4.0%) of 1453 females were of birth weights above 4000g<sup>2</sup>. It is also well known that macrosomia from whatever cause could have adverse consequences on the birthing process. The outcome could be unfavourable either for the mother or the baby or both, particularly if there is no timely intervention during labour<sup>3</sup>. Furthermore, previous publications from the University of Port Harcourt Teaching Hospital revealed that severe birth asphyxia occurred more commonly among full term than preterm babies, principally on account of cephalopelvic disproportion<sup>4-6</sup>.

Against this background, the authors set out to find out if there has truly been a sustained increase in the proportion of large babies born at the UPTH over a defined time frame.

### MATERIALS AND METHODS

The authors retrieved the birth registers from the delivery suite and theatre of the UPTH. Thereafter, the birth weights of all babies born in the hospital from

January 1, 1990 to December 31, 1999 were extracted and entered into specially designed proforma. The birth weights were subsequently sorted into sets of males and females and studied in three subgroups less than 2500g, 2500g to 3999g and 4000g and above. The focus of the study was the category of birth weights of 4000g and above. The data were grouped into monthly and annual totals involving the ten-year period of observation and analysis was by means of the statistical package PEPI (Computer Programs for Epidemiologic Analysis)<sup>7</sup>. Cumulative monthly totals, geometric means for each month of the ten-year period and the proportion of babies in each birth weight category were calculated. Seasonal variations in occurrence of babies of birth weight =4000g weights were calculated using Ratchet Circular Scan test for a short seasonal peak<sup>7</sup>. Subsequently, the ten-year period was elongated into a twenty-point observation scale and the periodic fluctuations in the proportion of birth weights =4000g smoothed by using exponentially weighted moving averages with a weighting factor of 0.18<sup>7</sup>. The percentage of babies of birth weight =4000g in each of the twenty observation periods was then plotted on a time scale to observe the trend. Proportions were compared using chi-square statistic and in all cases statistical significance was placed at a level of  $p < 0.05$ . Results were displayed by using frequency tables and various forms of charts and graphs.

## RESULTS

Fourteen thousand three hundred and seven birth weights were recorded; 7111 males and 7196 females. In Tables I and II are shown the cumulative monthly totals for the males and females respectively. Also shown are the monthly totals in each of the birth weight category under review and the geometric mean birth weights for each month. Nine hundred and four (12.7%) and 434 (6.0%) of males and females respectively were 4000g and above. There was a significant 3-month peak August to October of males of birth weight = 4000g, but not of females, (3-month peak: August to October: 30.3% of events. Test statistic = 3.46,  $p < 0.005$ ).

### Trends in the rate of delivery of babies of birth weight =4000g

These are shown in Figures 1 and 2. As shown, there was a sustained increase in the proportion of this category of babies during the observation period although the slope was steeper among the males, (slope with [95% Confidence Interval].for males = 0.4131 [0.3213 to 0.5050] and for females 0.1801 [0.5565 to 0.3045]. Furthermore, the proportion of male babies of birth weight =4000g appeared to have stabilized just above 12 percent in the last 4 observation periods.

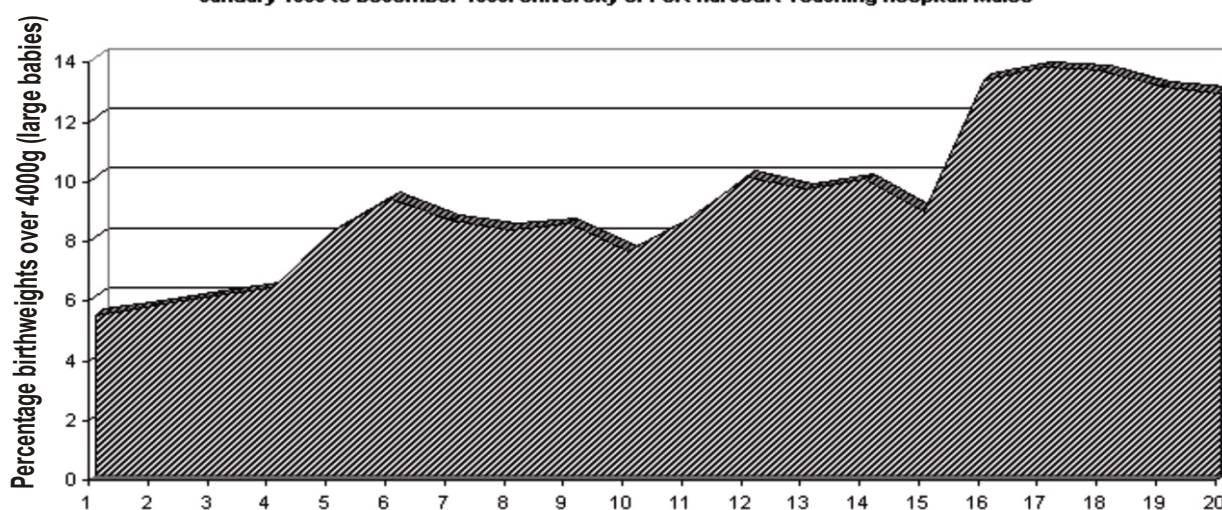
**Table I. Monthly birth weight distribution of 7111 births at the University of Port Harcourt Teaching Hospital, Nigeria. Cumulative data from January 1990 to December 1999 males. Figures in parentheses are percentages of monthly totals**

Weight categories (g)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Totals
Geometric means (g)	3146	3001	3131	3158	3169	3224	3130	3112	3165	3229	3202	3173	3159
<2500	47 (9.7)	40 (11.6)	57 (9.4)	56 (8.3)	75 (9.4)	51 (7.7)	74 (11.4)	80 (12.1)	57 (9.7)	55 (8.2)	45 (9.1)	55 (11.4)	692 (9.7)
2500 – 3999	377 (77.6)	277 (80.3)	484 (80.1)	541 (79.9)	623 (77.8)	534 (79.2)	496 (76.4)	494 (74.6)	450 (76.5)	508 (76.0)	390 (79.1)	341 (73.5)	5515 (77.6)
=4000	62 (12.8)	28 (8.1)	63 (10.4)	80 (11.8)	103 (12.9)	89 (13.2)	79 (12.2)	88 (13.3)	81 (13.8)	105 (15.7)	58 (11.8)	68 (14.7)	904 (12.7)
Totals	486	345	604	677	801	674	649	662	588	668	493	464	7111 (100.0)

**Table II. Monthly birth weight distribution 7196 births at the University of Port Harcourt Teaching Hospital, Nigeria. Cumulative data from January 1990 to December 1999 females. Figures in parentheses are percentages of the monthly totals**

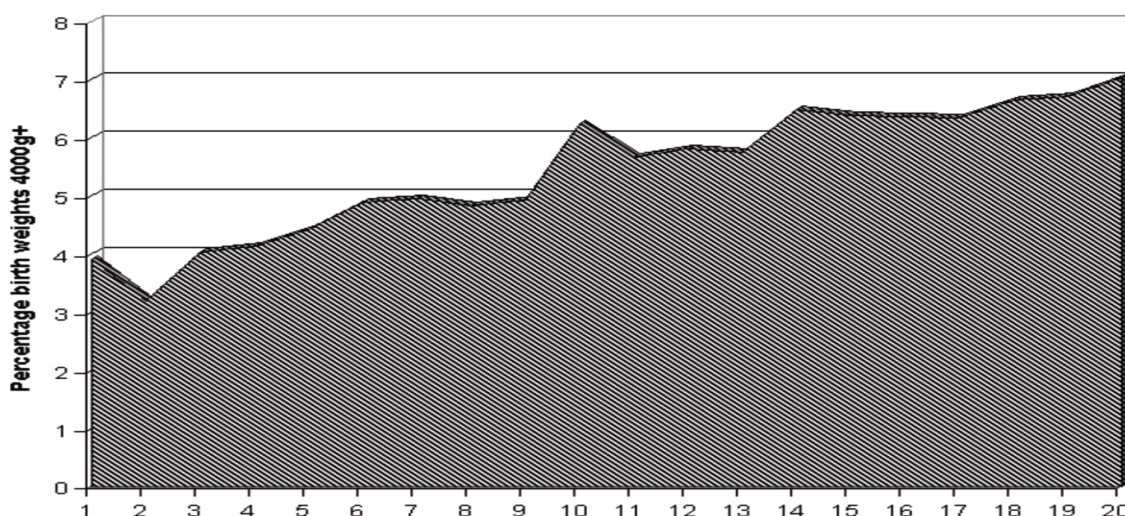
Weight categories (g)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Totals
Geometric means (g)	3042	3068	2969	3047	3073	3025	3016	3028	3014	3074	3073	3049	3039
<2500	55 (11.5)	32 (9.8)	68 (11.3)	51 (8.0)	74 (9.4)	72 (10.9)	85 (13.3)	76 (10.9)	88 (14.0)	67 (10.3)	63 (10.9)	52 (10.2)	783 (10.9)
2500 - 3999	384 (80.0)	275 (84.1)	510 (84.9)	557 (87.3)	676 (85.5)	545 (82.7)	505 (79.2)	581 (83.2)	501 (79.7)	544 (83.6)	473 (82.1)	428 (84.3)	5979 (83.1)
≥4000	41 (8.5)	20 (6.1)	23 (3.8)	30 (4.7)	41 (5.2)	42 (6.4)	48 (7.5)	41 (5.9)	40 (6.4)	40 (6.1)	40 (6.9)	28 (5.5)	434 (6.0)
Totals	480	327	601	638	791	659	638	698	629	651	576	508	7196 (100.0)

**Exponentially weighted moving averages of birthweights 4000g+ plotted against six-monthly intervals from January 1990 to December 1999. University of Port Harcourt Teaching Hospital. Males**



**Fig.1. Six-monthly observation periods from January 1990 to December 1999. (slope with [95% Confidence Interval] = 0.4131 [0.3213 to 0.5050])**

**Exponentially weighted moving averages of birth weights 4000g+ plotted against six-monthly intervals from January 1990 to December 1999. University of Port Harcourt Teaching Hospital. Females**



**Fig. 2. Six-monthly observation periods from January 1990 to December 1999. (slope with [95% Confidence Interval]. = 0.1801 [0.05565 to 0.3045]).**

## DISCUSSION

There has been a steady increase in the proportion of babies of birth weight =4000g at the UPTH in the past ten-year period. The overall incidence of the birth of this category of babies of 9.4% is much higher than the figure obtained in the same hospital approximately twenty years ago<sup>1,2</sup>. However, it is consistent with more recent global values of 5% -15%<sup>3</sup>. The rate of delivery of babies of this birth weight category tends to cluster around August to October over the ten-year period. The reason for these observations is not immediately clear, although there is the possibility of over feeding among some women during pregnancy, since by deduction these pregnancies could have probably occurred during the festive period around December. The observation that the males were significantly larger than the females is not new and is likely explained by the influence of the Y chromosome.<sup>3</sup> However; the authors believe that it is rather premature to speculate on the reason for the observed trend in this report. There is some disagreement regarding the definition of fetal macrosomia in an absolute sense. Most paediatricians prefer the term large for gestational age, which applies to newborns whose birth weights are above the 90<sup>th</sup> percentile for the given gestation and sex of the baby. This definition does not define an absolute value.<sup>8</sup> Some obstetricians consider the diagnosis of fetal macrosomia to be in excess of 4000g but most support the same diagnosis for 4500g or more of birth weight.<sup>3</sup> In this report, the authors decided on a cut-off value of 4000g and above since the idea was to study a trend over a defined time frame

The authors conclude that there has been a sustained increase in the proportion of large babies born at the University of Port Harcourt Teaching hospital during the ten-year period under review. This trend could be potentially dangerous for both mother and baby; therefore the authors believe it would be a good idea to carry out a prospective investigation along similar lines but using a much broader study base.

## ACKNOWLEDGMENTS

The authors are grateful to the nursing staff in the labour suite and theatre of the Department of Obstetrics and Gynaecology of the hospital for maintaining accurate registers of birth over the years. They are also grateful to the House Officers and Residents for meticulously entering the birth weights into the proforma provided and to Mrs. Nwosu, the departmental secretary for assistance with the data entry.

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