BIRTH WEIGHT PERCENTILES BY GESTATIONAL AGE: A HOSPITAL BASED STUDY

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Background: *There are no* present *or* old large population based birth weight nomograms available for Pakistani Population The aim of the study was to develop birth weight for gestational age nomogram for singleton and twin births. based on perinatal data collected prospectively. ***Methods:*** Until weight percentiles by gestational age were determined in women delivering at Agha Khan University Hospital Karachi from January 1992 to December 1994. This was a prospective cohort Study and included all women "lie delivered from 28 weeks to 44 weeks of gestation Singleton as well as twin pregnancies were included but women having intrauterine or intrapartum deaths were excluded ***Results:*** Data of 1041 live births were collected from 4041 deliveries. Total infants were 4112, there being 71 sets of twins The male babies were heavier than female babies at each gestational week There was a preponderance of male infant's tor each week Out of 4041 deliveries, 414 babies were born before 37 completed weeks; percentage of preterm birth is 10.24%. Males were more likely to be born preterm (hen were females, although females were more likely to be of low birth weight. Out of 414 preterm births. 281 were male and 183 were female Out of them data of 4030 live births was compiled and analysed; percentiles were formed and compared with other studies.

INTRODUCTION

The concept of classify mg the newborn according to birth weight norms by gestational age has gained popularity as a useful mean of identifying infants who are either small for gestational age (SGA) of large tor gestational age (LG A). These norms have been used lot at least three different purposes

1. To identity high-risk neonates
2. To classify outcome in epidemiological studies of risk factors for foetal growth retardation
3. As intrauterine growth standards.

There are no present or old large population- based birth weight nomograms available for Pakistani Population in Pakistan we use "Colorado growth charts" produced by Lubchenco et al[1]. These growth charts were produced in America for their own population. As our population has many different nutritional, physical, genetic, socio-economic and geographic variables, therefore these charts are not fully applicable to our population Secondly they were produced about 30 years ago and are no more applicable even for the population of United States. Ideally in our country we should have our ow n growth charts based on our own population so we can apply those charts and graph for different purposes.
No such data is available for any third world or developing countries. In our country computer programs have not been established and there is no central vital statistics department to collect the data on population basis and analyse it for future application. Most of our females are illiterate and cannot provide

reliable information about their I.MP it is difficult in calculate the gestation from such dates. Only the minority. which deliver at hospital, that is about 20-30%, remember their dates. Therefore, practically u is impossible to calculate the LMP.

Low birth weight alone is a better predictor of mortality and morbidity then gestational age alone but for a given birth weight a greater gestational age is associated with a decreased risk. Birth weight for gestational centile chart is widely used to assess intrauterine growth. Not all the individual babies in low centile group will have had poor nutrition m utero: some will be constitutionally small. For a given gestational age an individual baby has an intrinsic growth potential which it may have achieved, failed to achieve, or over achieved.

The Agha Khan University Hospital is located at the centre of Karachi and receives population in Obstetrics & Gynaecology from upper middle class or upper class, as there is no welfare coverage for deliveries. An attempt was made to include those women belonging to relatively poor social class who attend the Community Health Centre at this hospital and deliver here. Most of these patient's arc educated and about 98% are booked. About 85-90% of them get booked in first trimester of pregnancy and hence this group of patients have ultrasound between 16-20 weeks of pregnancy. Majority of these patients do remember their LMP and hence the calculation of gestational age is correct. Correlation of the gestation with ultrasound scan done between the 16-20 weeks in also perform^ in most pregnant patients[8].

The aim of the study was to develop birth weight

for gestational age nomograms for singleton and twin births, based on perinatal data collected prospectively from January 1992 to December 1994, at the Agha Khan University Hospital Karachi. The objectives were:

1. To obtain the gestational ages of all females registered and or delivering at the Agha Khan University Hospital between the mentioned dates of study.

2. To obtain the birth weights of all live births to these females during the study period.
3. To develop birth weight and gestational age percentiles (nomograms) for all the infants included in the studs.
4. To identify from the nomograms. risk factors for high-risk groups, such as intrauterine growth retardation (HJGR} in babies assigned to Small for Gestational Age (SGA) group, and risk factors for perinatal mortality for the Large for Gestational Age (I GA) group.

MATERIALS AND METHODS

This was a prospective cohort observational study conducted at Agha Khan University Hospital Karachi. It included all the live births, singleton and twins from 28 - 44 weeks' gestation in the period from January 1902 to December 1994. We collected over four thousand cases and analysed the data by using computer programs.

We excluded the intrauterine deaths and women delivering before 28 completed weeks. Women who were not sure of their l.MP were also excluded. Babies with gross congenital abnormalities were also excluded. Exclusion criteria are depicted in Table 1.

Table-1: Exclusion from the working data as completed weeks since the first day of the last menstrual period 1 he births weight (in grains) was taken just after the birth of the babies, after division of' umbilical cord and application of same plastic clip (Bever Medical Industries) lo each baby's umbilical cord Baby was weighed without any wrapping sheets by weighing machine of same model (Tanita- capacity 20kg).

After delivery, the pediatrician examined each infant, and Dobowitz scoring for gestational age was done routinely in our hospital or those infants who had any clement of II GR (intrauterine growth retardation) or any other risk factor, the neonatology-a was sailed at the time of delivery for Dobowitz scoring just after the delivery the infant having discrepancies of 4 weeks or more in gestational age by I MP and Dobowitz, were excluded

Percentiles were made in regression order using SPSS computer program and identifying 99th. 97th, 95th. 90ih. 75th. 50th. 25th. 10th. 5th. 3rd and 1st percentiles: graphs were charted for male and female separately. Percentiles were calculated for each completed week of gestational age for both male and female babies After charting out the graph, it was compared with the standard birth weight graph produced by Arbuckle and lubchinco[1].

Moreover, we tried to separate the nomograms for male and female infants at a particular gestational age. We also separate the normograms tor singleton from twins at particular gestation age for women delivering at the Agha Khan University Hospital. Karachi. Pakistan.

SGA babies have high perinatal mortality rates and we tried to identify from these normograms the risk factors for intrauterine growth retardation as well as identification of high-risk pregnancy; later on we tried to apply these graphs as a measure of infra uterine growth of a baby.

RESULTS

Data of 4041 live births were collected from 4041 deliveries, total infants were 4112. there being 71 sets of twins.

From this study we have concluded that male babies are heavier than female babies at each gestational week as shown in tables. I his difference is more marked after 34 weeks of gestation Before that we have very less number of cases for each week, hence the difference is not marked and even at 28 and 33 weeks the mean weight for female infants is more as compared to the mean weight for male infants.

Tablc-2: Mean, Median, Mode, Standard Deviation for singleton Male live birth by gestational age.

Weeks	No. of Cases	Mean Weight	Median	Mode	SD
28	6	800	915	70	382
29	7	1613	1300	1300	1138
30	11	2212	1650	1010	1425
31	4	1713	1575	1000	719
32	9	2179	1900	1360	724
33	12	1782	1900	1180	429
34	35	2337	2250	2300	577
35	37	2532	2450	2300	608
36	110	2708	2735	2800	479
37	249	2905	2900	3000	510
38	478	3151	3150	3000	428
39	529	3243	3200	3200	448
40	425	3437	3350	3000	1828
41	113	3461	3500	3500	441
42	17	3677	3600	3200	424
43	-	-	-	-	-
44	-	-	-	-	-

Table-3: Mean, Median, Mode, Standard deviation for singleton female live birth by gestational age

Weeks	No.	Means	Median	Mode	SD
28	7	1429	1200	650	997
29	7	1016	1100	1100	299
30	14	2026	1395	1300	1187
31	5	1468	1300	700	688
32	10	1872	1745	1800	497
33	16	1832	2045	2233	466
34	21	2176	2360	880	664
35	37	2429	2430	2500	546
36	66	2658	2525	2400	662
37	201	2860	2830	2800	473
38	382	3055	3025	3000	437
39	539	3224	3150	3000	1602

40	471	3196	3200	3000	464
41	144	3313	3295	3500	426
42	7	3130	3100	2840	296
43	-	-	-	-	-
44	-	2920	2920	2920	-

Table-4: Comparison of male and female infants Number *&* mean weight by gestational age

Weeks	No. Of Male Infants	Mean Weight In Gram	Female Mean	Weight In Gram
28	6	800	7	1429
29	7	1613	7	1016
30	ii	2212	14	2026
031	4	1713	5	1468
32	9	2179	10	1872
33	22	1782	16	1832
34	35	2337	21	2176
35	37	2532	37	2429
36	110	2708	66	2658
37	249	2905	201	2860
38	487	3151	382	3055
39	529	3243	539	3224
40	425	3437	471	3196
41	113	3461	144	3313
42	17	3677	7	3130
43		-	-	-
44	-	-	-	2920

Table – 5: Comparison of 10th centile of our study with 10th centile for white male and female by Amini *et al.*

WEEKS	MALE	FEMALE	WHITE MALE	WHITE Female
33	1186	1010	1640	1515. ^
34	1768	1080	1780	1680
35	1576	1802	1940	1960
36	2062	1870	2153	2170
37	2290	2300	2410	2313
38	2609	2500	2580	2520
39	2700	2600	2770	2660
40	2800	2600	2915	2870
41	2900	2800	3000	2900
42	3180	§H	3080	3015
P = Pakistan				

The second conclusion is that there is preponderance of male infants for each week, as shown in table 4. We have a total of4041 deliveries and 4112 infants out of whom 2126 were male and 1986 were female.

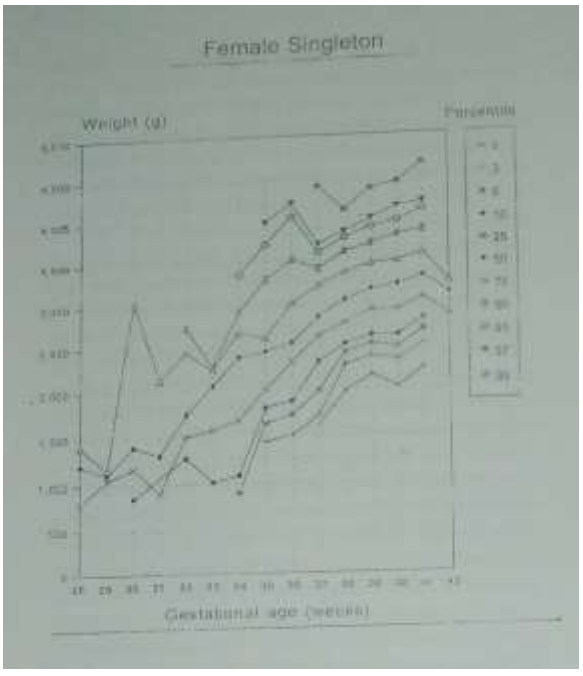
The ratio is 100 females for 106 males; according to this study at birth there is preponderance of male babies. In our adult population the ratio is 100 females and 110.59 male according to the census of 1981. Out of 4041 deliveries, 414 babies were born before 37 completed weeks; percentage of preterm birth is 10.24%; the corresponding percentage for Canadian population is 6.2%. Male were more likely to be born preterm then were females, although females were more likely to be of low birth weight. Out of 414 preterm births, 281 were male and 183 were female.

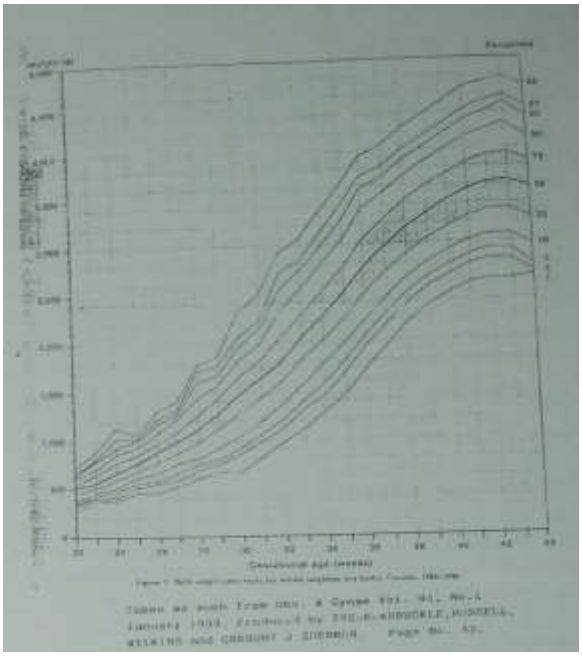
There were 488 infants weighing less than 2500gm. in weight. Total percentage for low birth weight is 12.2%. Among 488 infants 235 infants were

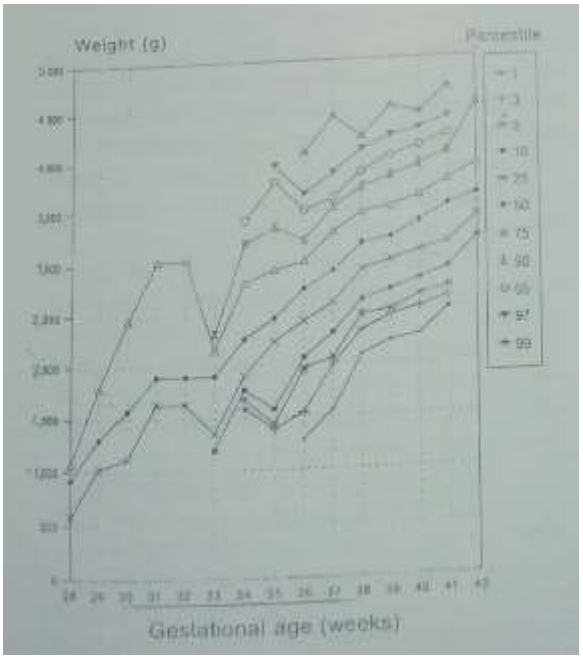
of term birth i.e. delivered after 37 completed weeks, j Hence our 6.60% babies born after 37 completed weeks I were low birth weight i.e. weighing less than 2500gram I and rest were low birth weight and preterm also.

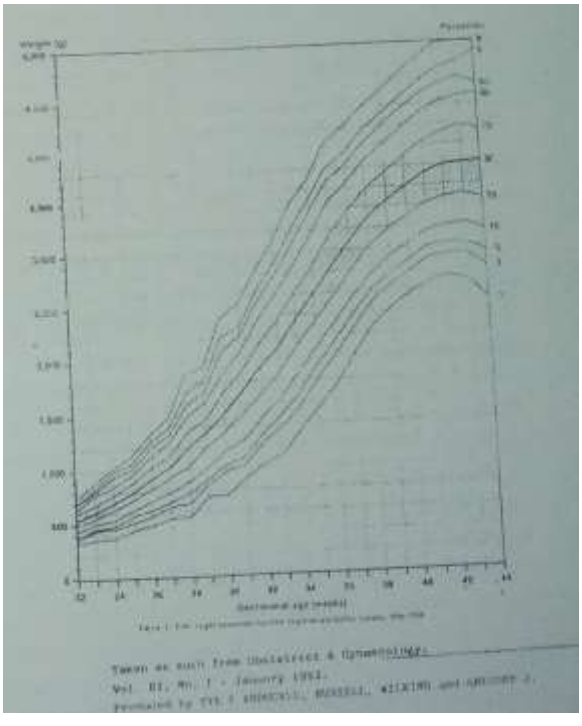
In table No. 4 different percentiles for male n and female singleton live birth are given respectively 4 when plotted on a graph. When graph 1 & II are i compared with the graph produced by Lubchinco[9] it is I found that the birth weights for males & females in Pakistani population at different gestation is less as compared to the Canadian Population.

In table 4 the mean weight of the male infants at different gestation is compared to female mean birth R weight. The conclusion is that male babies are heavier, than the female infants at different gestation weeks. We have calculated the different percentiles for twin males and females at different gestational weeks. Bui the data is small and graphs could not be plotted


Female Singleton
Weight (g)
Percentile
Gestational age (weeks)




Weight (g)
Percentile
Gestational age (weeks)



Weight at delivery was once considered evidence of prematurity (birth weight 25(K)gm) or post maturities (Macrosomia; birth weight –2500 gm). These criteria were later revised when it was realized that abnormal growth was reflected in factors other than birth weight. Normative standards were developed that include birth weight, length, and head circumference according to gestational age. Abnormal foetal growth is now defined according to percentile. Infants classified as small for gestational age (SGA) are in the I0th percentile or below, and those classified as large for gestational age (I-GA) are in the 90th percentile or above. Standards now also vary between different populations'.

With the detailed comparison of gestational age to birth weights. Lubchenco and co-worker[1] constructed foetal growth curves. Then later on in 1967 Battazlia and Lubchenco classified small for gestational age (SGA) infants as those whose weights were below the 10th percentile for their gestational age. Large for gestational age (I.GA) infants had birth weights above the 90th percentiles for their gestational ages. Infants between the 10th and 90th percentiles were classified as appropriate for gestational age (AGHA). This simple but effective method of defining normal and abnormal foetal growth was followed by the recognition that small for gestational age infants, whether preterm or term, had significantly increased perinatal mortality[1].

Arbuckle' has published data on birth w-eight percentiles by gestational age for Canada. In that studs he collected the data for more than one million births covering 3 years of singleton and twin live births in Canada from 1986-1988. This was one of the largest data sets ever assembled for this type of analysis, and consequently provides stable birth weight and gestational age percentiles for classifying newborns from a developed country, as small for gestational age (SGA). appropriate for gestational age (AGHA). and large for gestational age (LGA) based on recent observation.

Unless we recognize a pregnancy or infant as SGA we will not able to manage or treat the infant properly. For any sort of management diagnosis is essential: therefore, birth weight norms should be known for a particular population. Birth weight norms are essential to identify the pregnancy at risk and also essential in epidemiological studies to identify the risk factors for SGA infants. Birth weight percentiles for gestational age can be used to define factors affecting intrauterine growth or to assess risk for infant mortality or morbidity. However, these norms presented here are not intended to use as intrauterine growth standards: In most of the studies 10th percentile has been used as a cut-off of SGA and any infant having weight less then 10 centiles were described as SGA. The study by Arbuckle in 1993 has mentioned that this cut-off can be reduced to filth or even third percentile, but tor a given Pakistani population the 10th percentile may he -f different then the 10th percentile for the population of 31 Canada. The change of this percentile can only be done by study of a year large population when we compare the infant mortality for that population at 15th. 10th. 5th ... and -3rd percentile. If there is no statistical difference for infant mortality at 15-10 percentile group but sUHislic.il difference between 15-10 and 5th and 3rd percentile group only then we can change the 10th H percentile as a cut-off to 5th or 3rd centile for a given population. II all depends on the observation in large population based studies and further work is needed to I evaluate these percentiles.

For SGA neonates needing intensive care it J must be kept in mind that there are other factors also | involved in the growth of the infants and management strategies can be altered accordingly[10]. These factors like small mother i.e. with less height and weight: race parity and mother's previous obstetric experience should be noted down for each SGA infant. About 40%i stillbirths and 86% of early neonatal deaths are associated with low birth weight. The definition of low birth weight is a weight less than 2500 grams or i recently it is the birth weight less than 10 percentiles for 1 a given population. Low birth weight is associated with I series of pathological conditions such as respiratory | distress syndrome and problem of the maintenance of. blood pressure, temperature regulation and feeding. The condition could best be treated by prevention of: such deliveries

It is apparent that black infants generally weigh less than the 10th percentile cut-off point. It is not clear that this difference is solely a result of genetic potential for growth; instead black infants have higher 1 risk factors for low birth weight, including lower maternal socio-economic status and more instances of maternal hypertension11.

In table VII, 10th centile of birth weight for females and males at different gestational weeks of our population is compared with the 10th centile of birth weight for mates and females at different gestational weeks of white population. The conclusion is that our 10th centile of birth weight is lower for both male and female infants at different gestational weeks

Male newborns weigh more than females, and it has been proved by studies of Lubchenco[1]. Arbucklr[2,3]. etc.; this small study mentioned here also has similar results. Therefore 10th percentile cut-off is higher for males than females. Since there is no additional risk to mothers delivering male infants and since female infants do not appear to be at disadvantage because of their low weight, it seems reasonable to use.

sex specific standard.

Infants born to parous women are generally heavier than those born to nulliparous women. Their 10th percentile cut-off is higher as compared to nulliparous women. It is not clear whether primiparous women have more or less risk factors for IUGR or if their infants face disadvantages[13].

There is reasonable evidence that infants born to mothers residing at high altitudes have smaller babies and some people have adapted using standards based on geographic location because there is no reason to believe that these high altitudes babies have less genetic potential to grow' than other babies. It seems reasonable to conclude that the high altitude is a growth retardant and should be considered as a risk factor for IIJGR. When establishing standards, the issue of which infant to exclude for medical risk factor indication is difficult the resolve. Some authors, especially those using vital statistical data exclude no cases, like Arbuckle have done recently in 1993. Other authors exclude some infants with congenital abnormality but include others. Most but not all exclude multiple births. Miller and Meartts exclude not only abnormal infants, perinatal deaths, and multiple births, but also those with any known risk factor for IUGR as smoking, hypertension etc[16]. Arbuckle have included singleton and multiple births but he divided them and made percentiles for male and female and singleton and twins separately[17].

The population of Pakistan has different ethnic groups. Moreover, it is a poor country with high illiteracy rates, and antenatal and obstetrical care are near to non-existence. To develop norms for such a country is very difficult. Currently data collection from hospitals is very difficult because of non-booking status, high illiteracy rate; uncertainty of LMP and influences of different ethnic. For developing norms to apply countrywide we have to develop a central bio-statistical department using computerized data by registering each and every birth along with histories and birth weight. Information should be sent to the central bio statistical department. This can only be done by improving the literacy rate and by eradication of poverty.

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