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Standard Birth Measures and their Conditional Expectations in the Northern Part of Jordan

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ABSTRACT

Introduction: *The evaluation of newly born infants, by birth weight in relation to gestational age, parity number, and age of the mother for the purposes of checking the impact of maternal characteristics on the baby size especially for monitoring and evaluating mother and child health programs are of great interest to health management researches.* ***Aim:*** *The aim of the study is to obtain a model for predicting birth measures (weight, height, head and chest circumference), at the time of delivery to help in giving the medical aids to the mother and child on time; and to prevent childbirth complications that endanger baby's and mother's life.* ***Materials and methods:*** *Total 970 delivery cases were studied, 2 registered nurses as interobserver for physical measurement for each newly born baby were assigned. The 'Central Limit Theorem' technique has been used as a model for prediction of newborn babies at the time of delivery.* ***Results:*** *An increase in the birth weights positively correlated with an increase in gestational age increases; increasing the number of pregnancies one expects the increase in birth weight; and, dropout rate of birth measures among children born to mothers of low socio-economic class, hence higher the level of development and standard of living, the higher the birth weight.* ***Conclusion:*** *It provides a substantial data for health policy and decision makers over a few maternal characteristics on the weight, head and chest circumference of the newborns in the northern portion of Jordan which are clearly not accessible to bridge the gap between what is needed and the genuine far-reaching selection of clinical hones to encourage secure conveyance cases in consonance with local and applied standard birth measures.*

Keywords: Multivariate normal distribution, Multiple regressions, Gestational age, Newly born infant, Birth weight, Infant mortality

INTRODUCTION

Maternal and child care should be discussed as a factor of primary importance in considering the practical possibility of influencing the length of gestation, birth weight, length, head and chest circumference, by improvement in the condition of development of the fetus and the child. In discussing the relationships between the length of gestation and the childbirth weight, for instance, the fact must be born in mind that both elements of this relation are conditioned on many different factors and that they show a wide variability.

An attempt was made to obtain information with respect to birth delivered in Irbid governorate, to assure the normal development of the child and its capacity for normal reproduction in the future.

Fetus growth was investigated by several authors in various developed and developing countries. Some of them have discussed the relationships between length of gestation and birth measure, because of its great importance for pediatrics, obstetrics and forensic practices.

The standard birth measures are often substituted by the quality measures to spot gaps within the quality of care, and to enhance the provision of health services with regards to international standards and therefore the relevant quality notice. The management of the hospital will use them to assess and monitor the provision of resources, the performance of the processes, rooms for improvements, thence driving quality improvement in obstetrics and gynecology area in King Teaching Hospital. The absence of criteria for meeting normal birth measures at the time of delivery can have an effect on the standard of services and the safety of mothers and their newborns within the overcrowded gynecology words. With the contingent increase range of delivery cases within the hospital, nice attention ought to shift to the standard of care, as poor performances were witnessed once the large move of Syrians and Iraqis population crossed borders to Irbid governorate in Jordan. Therefore, this needs skills and capability to deal with normal delivery and complications that need prompt medical interventions.

This study based on the analysis of 970 births during the year 2016 in Irbid governorate, Irbid city, the centrally and heavily located with numerous socio-economic classes, as immigration from villages and other smaller towns is still taking place, in regard to being the most suitable place for such investigation, and it is quite evident why the medical city King Abdullah the First Hospital, Jordan University of Sciences and Technology Hospital (JUST Hospital) is chosen for this study is the largest and the most modern teaching hospital in Irbid Governorate. It is a very well equipped and with various facilities in the nearly every field of specialization.

The average number of patients visiting the department of obstetrics and gynecology is 35-50 patients per day due to large insured patients referring to that hospital from the Ministry of Health (MOH), Royal Medical Services (RMS), in addition to its main patients of the university employees and their dependents, who received free medical treatment and are from the middle and low-income classes.

As health and nutrition needs for mothers are presumably met in Irbid governorate, antenatal care is available in the 27 comprehensive health centers in addition to the mother and child care clinics in the outpatient department at JUST Hospital, the absence of international standards birth measures for newborns, coupled with obviously the overutilization of obstetrics and gynecology services by a large number of cross-border displaced population (Syrian, Iraqis) in addition to the referred cases from the government and private hospitals, have exhausted the clinical practices in the obstetrics and gynecology units in JUST Hospital. This imposes more risk in neonatal, and delayed care at the time of delivery; childbirth complications that endanger the baby and the mother's life; injuries resulted from failure to provide prenatal care, deal with difficult labor, respond appropriately to bleeding, inappropriate use of forceps, recognize symptoms of fetal distress and respond to it, provide proper care to premature babies; and essential to reduce medical malpractices (i.e., negligence resulted in cerebral palsy, Erb's palsy, clavicle fracture, and, facial palsy) complications and prevent mortality rates. This study comes to investigate the standard birth measure and their conditional expectations to provide swift and proper medication for the delivered babies and mothers at the time of delivery.

Aims of the Study

The main aims of this study are to:

- Obtain a model for predicting birth measures (weight, height, head and chest circumference), at the time of delivery to help in giving the medical aids to the mother and child at the time of delivery.
- Determine the birth measures in relation to the length of gestation.
- Determine the relationship between weight and number of pregnancy.
- Demonstrate the effect of socio-economic class on the weights of the newly born babies.

Importance of the Study

The population of Irbid approximately 2 million, is been served by only one referral and teaching hospital (JUST-hospital, 678 beds), were most deliveries occurred and is frequently engaged by cross-border (Syrian Immigrant (about 1 million)) and internally referred population due to political and other reasons i.e., infrastructure. The ultimate 3 million populations of women receiving antenatal, obstetric and gynecology services have lack of services which may affect all newborn infant from high-risk pregnancies.

This study emerged to examine the importance of the implementation of international standards birth measures for newborns in JUST teaching hospital, distinguishing risks related to mothers and their newborns, which are crucial for clinical practices; offer correct care to premature babies; notice diseases within the early stages and verify the causes and effects of them, reduce medical malpractices, and therefore the required treatment or care for the mother and child.

PATIENTS AND METHODS

In addition to a micro sampling of patient records, the researchers assign 2 registered nurses as interobserver for physical measurement for each newly born baby which was taken based on the World Health Organization standards. Differences in the physical measurements exceed the allowable standards, i.e., weight 5 g, head circumference 5 mm, were corrected by recruitment of a third observer to retake the measurement again and again to ensure maximum validity.

The mother was asked to state the first day and the last day of the menstrual period which if not known with certainty would be excluded from the analysis. Notes were made of their usual menstrual cycle whether the last period was normal or not and whether any bleeding had occurred since the given date of the last period. So, the gestational age of the baby could be recorded in complete weeks. The socio-economic conditions of the mother, as well as her age and some other affecting factors, were also taken into consideration in the analysis. The pregnancy number (including abortions) rather than the parity has been considered, the data "virtual" prim imperia (i.e., first birth with one or more previous abortions) are included in the second and the later pregnancy number because the exclusion would make no difference in the mean birth weight.

The mean and the standard deviation were based on the assumption of a normal distribution (skewness and kurtosis) with 4 parameters which construct the curves for birth weight head and chest circumference and height as the main parameter.

Procedural Definitions of Birth Measures

Birth weight: The newborn's weight is reported in grams, or pounds and ounces (converted to grams).

- Low birth weight: Infants weighing less than 2,500 grams (about 5.5 pounds) at birth.
- Very low birth weight: Infants weighing less than 1,500 grams (about 3.3 pounds) at birth.
- Extremely low birth weight: Infants weighing less than 1,000 grams (about 2.2 pounds) at birth [1,2].

Fertility measures:

- Birth rate or crude birth rate: The number of live births per 1,000 total populations.
- General fertility rate: The number of live births per 1,000 females ages 15-44.
- Age-specific fertility rate: The number of live births per 1,000 females in an age group [3].

Gestational age, prematurity: Gestational age is based on the computed difference between the date of last normal menses and the date of the infant's birth. If the date of last normal menses is missing or the computed difference is less than 16 weeks or more than 45 weeks, then the clinical estimate of gestational age reported by the attending physician is substituted. This minimizes the number of births with unknown gestational age.

- Premature or preterm: Births are classified as premature (less than full term) if the gestational age was less than 37 weeks. Births before 32 weeks of gestational age are "very preterm." Those 32 to 36 weeks are "moderately preterm."
- Premature low birth weight: Births that have both a gestational age of fewer than 37 weeks and a birth weight of fewer than 2,500 grams (about 5.5 pounds).
- Term low birth weight: Full-term births with low birth weight; that is, births that have a gestational age of 37 weeks or more and a weight at birth of fewer than 2,500 grams (about 5.5 pounds) [3-5].

Infant mortality: Infant mortality refers to deaths that occur within the first year of life.

- Infant mortality rate: The number of infant deaths per 1,000 live births during the year.
- Neonatal mortality: Infant deaths that occur before 28 days of age.
- Post-neonatal mortality: Infant deaths that occur from 28 to 364 days of age.

Single or multiple births:

- Plurality: The number of fetuses in this pregnancy (single, twins, triplets, etc.). Not all may result in live births [2,3,6].

Relationship between Birth Weight and Gestational Age

Today, it is realizing that many infants may represent a deviation of intrauterine growth; that these infants either may be too big or too small for their length of gestation. For example, the infant born to the mother with diabetes is perhaps the best-known example of the infant ‘too large for length of gestation” although there also are infants with Beckwith’s syndrome, transposition of the great vessels, and post-term infants who continue to develop because the placenta does not show the normal aging and fibrinous degeneration. Of the infants who at birth are small for their length of gestation or are dysmature-the best known is the twin [7]. Ordinarily, the uterine environment favors only one pregnancy. The presence of two placentas may result in two undersized babies or else one normal sized baby and one markedly small, particularly in identical twins. Twins are representative of those infants who are true nutritional dysmature, where there have been a normal number of cell divisions but whose individual cells are small (in obstetrics, denoting an infant whose birth weight is inappropriately low for its gestational age). This group includes infants born to mothers with toxemia, hypertensive cardiovascular or renal disease, at high altitude or with insufficient placentas. Characteristically these infants are small but normal [8,9].

They grow rapidly after birth and do well unless there has been a severe chronic problem of anoxia affecting the fetus. However, another category, the total growth dysmature, include infants born with a variety of genetic diseases (for example, cystic fibrosis, osteogenesis imperfecta), those born with chromosomal problems such as Down’s syndrome (mongolism), 17-18 trisomy and 13-15 trisomy; severely malformed infants (for example, primary microcephaly, holoprosencephaly, Cornelia-de Lange syndrome, etc.) and a major group of infants severely affected due to early invasion of fetal tissues by rubella or cytomegalic inclusion viruses or with toxoplasmosis. These total growths dysmature lack the normal numbers of cells due to fewer cell divisions. Their prognoses, unlike the nutritional dysmature, are poor and limited [2].

The premature infant in the scale of “appropriateness for gestational age” is of normal size for the length of gestation and represents an infant born too soon, who was not allowed to stay in the uterus and enjoy the advantages of intrauterine development. An additional category is represented by infants known as post matures, who have been in uterus beyond 42 weeks and who have begun to resort their own tissues, show signs of weight loss but who are of a nominal length and normal head circumference [10]. These are another form of nutritional dysmature. Among the major reasons for the awareness of the various types of dysmature is that the nutritional dysmature, with his excellent prognosis, should be anticipated as a product of a high-risk pregnancy and within the first hours after birth begin to be fed with intravenous glucose-containing infusions. He lacks adequate glycogen reserves in his liver and must be supplemented with glucose very early after birth in order to avoid possible brain damage due to hypoglycemia [11,12].

Statistical Analysis

The article used the ‘Central Limit Theorem’ technique as a model for prediction of newborn babies at the time of delivery, because of its straightforward and quite technical projection technique resulted from likelihood theory; and, underneath sure circumstances, one will approximate some distributions with normal distribution though the distribution isn’t unremarkably distributed.

The Central Limit Theorem (CLT) assumed that the sampling distribution of the sampling means approaches is feting the normal distribution curve in the large sample size (above 30), apart from the shape of the sampled population. As the researchers approach 970 cases in JUST hospital, the graph of the sample means precisely closed to a normal distribution.

The most important issue in the CLT is the averages of the sample means which will constitute the population mean at the end. In parallel to that, the findings of the averages of the standard deviation of the sample will ease the findings of the standard deviation of the population of the study hence the accuracy of prediction of the population characteristics.

It is very important to both medical doctors and mothers at the time of delivery to have estimated birth measures of the newly born baby.

In this study, it is assumed that all birth measures are jointly multivariate normal distribution by applying central limit theorem due to large sample size N=970 with 30-50 patients from middle and the very low economic classes per day.

Assumptions:

- m: Rows, n: Columns
- μ=the mean average
- σ= the standard deviation

$\frac{\Lambda}{Y}$ = the conditional mean

$\bar{\div}$ = the sample mean

$\div$ = Random vector

aij -------- i^{th} - row , j^{th}=column. $A = \begin{bmatrix} a_{11} & a_{12} & \dots\dots & a_{1n} \\ \vdots & \ddots & & \\ a_{m1} & a_{m2} & \dots\dots & a_{mn} \end{bmatrix}$

ORDER --------mxn

{Central Limit Theorem} [x_1, ………, x_p (p=7)]

$\bar{\div}$ = (x_1 + x_2 + …………X_n)/n ………..Sample mean

$\square_1 = \left\{\overline{Y_1}, \overline{Y_2}, \overline{Y}, Y_4\right\}$ ….when $\sum_{i=1}^{970}$

when Σ_{i}^{9} = $\sum_{i=1}^{970}$ Yi/970

The joint density function of the random variables x_1, ……x_p (p=7, number of variables) is:

Where

Random vector $\underline{\mu} = \begin{bmatrix} \underline{\mu}_1 \\ \underline{\mu}_2 \end{bmatrix}$

Population mean vector $\underline{\mu} = \begin{bmatrix} \underline{\mu}_1 \\ \underline{\mu}_2 \end{bmatrix}$

Population variance-covariance matrix $\sum = \begin{bmatrix} \sum_1 & \sum_2 \\ \sum_2 & \sum_2 \end{bmatrix}$

Therefore, the predicted value $\underline{\overset{\Lambda}{Y}}$ is the conditional mean

$$\underline{\overset{\Lambda}{Y}} = \underline{\mu}_{\underline{x}_1|\underline{x}_2} = \underline{\mu}_1 + \sum_2 \sum_2^{-1}\left(\underline{x}_2 - \underline{\mu}_2\right)$$

Let

$$B = \begin{bmatrix} \beta_1 & \beta_2 & \dots\dots & \beta_{1n} \\ \beta_2 & \beta_{122} & \dots\dots & \beta_{2n} \\ \vdots & \ddots & & \\ \beta_{m1} & \beta_{m2} & \dots\dots & \beta_m \end{bmatrix}$$

Where

B=matrix of multiple regression coefficients therefore [13,14],

$$\hat{\underline{Y}} = \underline{\mu}_1 + B(\underline{x}_2 - \underline{\mu}_2)$$

$$\hat{Y}_1 = \mu_1 + \beta_1 (x_2 - \mu_2) + \beta_2 (x_2 - \mu_2) + ... + \beta_{1n}(x_{n2} - \mu_{n2})$$

$$\hat{Y}_2 = \mu_2 + \beta_2 (x_2 - \mu_2) + \beta_2 (x_2 - \mu_2) + ... + \beta_{2n}(x_{n2} - \mu_{n2})$$

$$\vdots \qquad \vdots \qquad \vdots \qquad \vdots$$

$$\hat{Y}_m = \mu_{m1} + \beta_{m1}(x_2 - \mu_2) + \beta_{m2}(x_2 - \mu_2) + ... + \beta_m (x_{n2} - \mu_{n2})$$

Application

To predict the birth measures (weight, height, head and chest circumference) for a given gestational period, parity and age of mother, are greater than or less than the mean averages, the sample population means were subtracted from the lower and upper values in the z-scores, the standard deviation should be divided by the square root of the sample (970), and the results of the subtracted means need to be divided by the results of the alienated standard deviation [15,16].

We have 4 dependent variables, m=4 (weight, height, head and chest circumference), and 3 independent variables, n=3 (gestational period, parity and age of the mother).
and,

$$\mu = \begin{bmatrix} \underline{\mu}_1 \\ \hline \mu_2 \end{bmatrix} = \begin{bmatrix} 3.356 \\ 48.785 \\ 33.824 \\ 32.699 \\ \hline 40.078 \\ 2.967 \\ 25.748 \\ \end{bmatrix}$$

$$\sum_{1.2} = the\, conditional \quad \text{var}\, iance$$

$$= \begin{bmatrix} .2237 & .38588 & .2786 & .36864 \\ .38588 & 5.58099 & 1.49767 & 1.63219 \\ .36864 & 1.63219 & 1.86479 & 3.22688 \end{bmatrix}$$

The multiple regression coefficient matrices (n=3, m=4,) is

$$B = \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{1n} \\ \beta_{21} & \beta_{22} & \beta 2n \\ \beta_{31} & \beta_{32} & \beta_{33} \\ \beta_{41} & \beta_{42} & \beta_{43} \end{bmatrix} = \begin{bmatrix} 0.16997 & 0.01424 & -0.02135 \\ 0.58894 & 0.55421 & -2.49674 \\ 0.44319 & 0.05243 & -0.13255 \\ 0.42523 & 0.05291 & -0.05532 \end{bmatrix}$$

Hence the predicted values of weight, height, head circumference, and chest circumference for a given mother age, parity number, and gestational age weeks are:

$$\begin{bmatrix} \hat{Y}_1 \\ \hat{Y}_2 \\ \hat{Y}_3 \\ \hat{Y}_4 \end{bmatrix} = \underset{(Z)}{\begin{bmatrix} 3.356 \\ 48.785 \\ 33.824 \\ 32.699 \end{bmatrix}} + \underset{(H)}{\begin{bmatrix} 0.16997 & 0.01424 & -0.02135 \\ 0.58894 & 0.55421 & -2.49674 \\ 0.44319 & 0.05243 & -0.13255 \\ 0.42523 & 0.05291 & -0.05532 \end{bmatrix}} \underset{(X-\mu_2)}{\begin{bmatrix} x_5 - 40.078 \\ x_6 - 2.961 \\ x_7 - 25.748 \end{bmatrix}}$$

For example, for a given gestational age weeks x_5, a parity number x6 and age of the mother years x_7:

$$\begin{bmatrix} x_5 \\ x_6 \\ x_7 \end{bmatrix} = \begin{bmatrix} 39 = gestation \quad period \quad (weeks) \\ 3 = parity \quad number \quad (numberof \quad pregnancy) \\ 25 = age \quad of \quad the \quad mother(years) \end{bmatrix}$$

$$H = \begin{bmatrix} 0.16997 & 0.01424 & -0.02135 \\ 0.58894 & 0.55421 & -2.49674 \\ 0.44319 & 0.05243 & -0.13255 \\ 0.42523 & 0.05291 & -0.05532 \end{bmatrix} \times \begin{bmatrix} -1.078 \\ 0.039 \\ -0.748 \end{bmatrix}$$

$$H = \begin{bmatrix} 0.16997 \times -1.078 + & 0.01424 \times 0.03 + & -0.02135 \times -0.748 \\ 0.58894 \times -1.078 + & 0.55421 \times 0.039 + & -2.49674 \times -0.748 \\ 0.44319 \times -1.078 + & 0.05243 \times 0.039 + & -0.13255 \times -0.748 \\ 0.42523 \times -1.078 + & 0.05291 \times 0.039 + & -0.05532 \times -0.748 \end{bmatrix}$$

$$= \begin{bmatrix} -0.1667025 \\ 1.25429839 \\ 0.37656665 \\ -0.41495509 \end{bmatrix}$$

$$\text{Y=Z+H} \begin{bmatrix} 3.356 \\ 48.785 \\ 33.824 \\ 32.699 \end{bmatrix} + \begin{bmatrix} -0.1667025 \\ 1.25429839 \\ 0.37656665 \\ -0.41495509 \end{bmatrix}$$

$$= \begin{bmatrix} 3.189 \\ 50.039 \\ 33.447 \\ 32.284 \end{bmatrix}$$

Therefore, the predicted values

$$\underline{\hat{Y}} = \begin{bmatrix} 3.189 \text{ kgm's, the expected weight of the baby} \\ 50.039 \text{ cm, the expected height of the baby} \\ 33.447 \text{ cm, the expected head circumference of the baby} \\ 32.284 \text{ cm, the expected chest circumference of the baby} \end{bmatrix}$$

$$\mu = \begin{bmatrix} \mu_1 \\ \hline \mu_2 \end{bmatrix} = \begin{bmatrix} 3.356 \\ 48.785 \\ 33.824 \\ 32.699 \\ \hline 40.078 \\ 2.967 \\ 25.748 \end{bmatrix}$$

RESULTS AND DISCUSSION

To prove the normality of the findings, the distribution of the scores on the dependent variables of weight, height, head and chest circumference is reasonably normal. Normal is used statistically to describe a symmetrical, bell-shaped curve, which has the greatest frequencies in the middle, with smaller frequencies toward the extreme. The statistical technique that this article used to assess normality is skewness and kurtosis values.

From Table 1 it could be seen that the mean birth weight is 3.356 kg, height is 48.745 cm, head circumference is 33.824 cm, chest circumference is 32.899 cm, gestational age is 40.078 weeks, parity number 3 times (2.967) and age of mother is 25.749 years with the corresponding standard deviation S.D are 0.51, 2.57, 1.55, 1.87, 1.03, 1.51, and 7.09 respectively. One can notice that in most of the cases, head circumference is larger than the chest circumference. This is obviously a true measure as the child gets older the chest circumference exceeds the head circumference. As a matter of fact, the newborn baby head circumference is measured by the level of her/his eyebrows 12.6 to 14.5 inches (32-36.8 centimeters), which is approximately larger than the chest circumference of 12.0 to 13.0 inches (30-33 centimeters); and, they will be equalized between the age of 6 months and 2 years.

Table 1 Mean and standard deviation of findings

Items	Mean	Standard Deviation
Expected Weight	3.356 kg	0.51
Expected Height	48.785 cm	2.57
Expected Head Circumference	33.824 cm	1.55
Expected Chest Circumference	32.699 cm	1.87
Gestational Age	40.078 weeks	1.03
Parity Numbers	2.967 times	1.51
Age of mother	25.748 Years	7.09

If the head circumference is larger than the chest circumference by 4 cm, this means that the head is growing faster and indicates an inherent disease is there, floods accumulation around the brain (hydrocephalus), injuries or ruptures by vacuums of forceps, etc. The large head circumference could be normal, but less than 32 cm could be problematic and suspicious for microcephaly which is mostly associated with fetal infection, congenital problems and chromosomal disorders.

The asymmetric growth restriction: baby with normal head circumference and small chest circumference is usually seen with mothers of high blood pressure or with kidney diseases, malnutrition which is associated with low socio-economic families. Also, the ratio of head and chest circumference are useful guides for the assessment of the amount of growth failure from malnutrition.

In Table 2, the statistical skewness and curtsies indicate that the assumptions of normality are relatively valid. The skewness value provides an indication of the symmetry of the distribution; and, the kurtosis provides information about the 'pawedness' of the distribution. If the distribution is perfectly normal, both values of skewness and kurtosis will be 0 (zero) which will be difficult to see in the social sciences. The positive skewness value of gestational age and the parity numbers 0.596 and 0.512 respectively indicate that the results are skew (scores clusters to the left and the low values). And, the negative skewness at the age of the mother's level indicate the clustering results scores to the right end. On the other hand, positive kurtosis values indicate that the normality distribution of the results are rather peaked and clustered in the center with long tails. All values of the results are below 0 (zero) which indicate that the distribution is relatively flat, and in many cases in the extremes as in the cases of heights and weight (Figure 1). This will not make any substantive difference and affect the analysis since the sample of the study is relatively high (970).

Table 2 Descriptive statistics independent (predictive factors) variables

Variables	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Gestational Age	970	40.078	1.03	0.596	0.241	-1.04	0.478
Parity Numbers	970	2.967	1.51	0.512	0.241	-1.173	0.478
Age of mother	970	25.748	7.09	-0.117	0.241	-1.631	0.478
Valid N (listwise)	970	-	-	-	-	-	-

For each number of pregnancy first, second, fifth, the linear relationship between birth weight and gestational age is positively correlated (Figure 1). The median for male and female is demonstrated according to the number of pregnancy in relation to gestational age of the fetus, the birth weight in both sexes which seems to have almost the same order of increment. It has been found that the birth weight of sexes is practically identical until 36-37 weeks of gestation, then there is a general increase thereafter; head and chest circumferences are topically identical for gender.

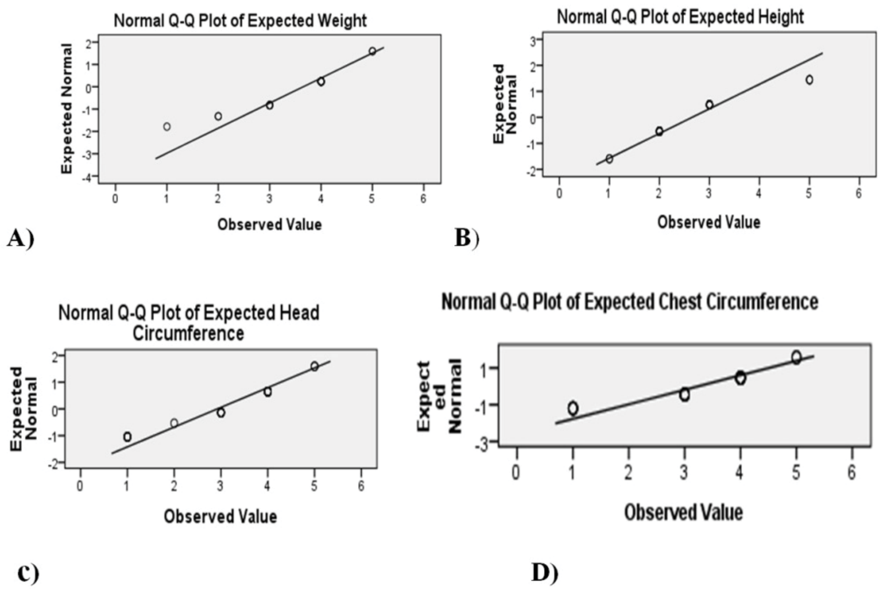

Figure 1 Estimates of collinearity diagnostics on the effect of gestational age, parity numbers and age of the mother over the newborn's weight, height, head and chest circumference

The linear relationship between pregnancy number and birth measures is another fact which is demonstrated above, i.e., by increasing the number of pregnancy one expects the increase in birth weight.

CONCLUSION

This study concluded that the change in birth weight with parity was entirely due to maternal pre-pregnant weight. Figure 1 showed that the fifth birth order is heavier than the first which come to a disagreement with the findings of outliers below the third birth. This obvious dropout the rate of birth measures among the children who were born to mothers of low socio-economic class, hence it is observed that higher the level of development and standard of living, the higher the birth weight.

The major determinant of birth weight in this study is the gestational age which has a mean of 40.078 (Table 2). It has found, multiple correlations of the 3 predictors (gestational age, parity numbers, and age of the mother) on the dependent variables (baby weight, head and chest circumference, and height), of a strong independent predictor of birth weight.

This study provides valid information for health policy and decision maker over some maternal characteristics on the size of the newborns in the northern part of Jordan which is obviously not available at all to facilitate deliveries and reduce complications.

Identifying infants with head, chest weight of abnormal measures required the early intervention hence the delay makes big difference in the functional and psychological outcomes. In alternative words, the early detection of deviated measures of head and chest circumference help the medical professionals to put the required medical care into place.

This study provides a valid information for health policy and decision maker over some maternal characteristics on the weight, head and chest circumference of the newborns in the northern part of Jordan which is obviously not available to bridge the gap between what ought to be and the real widespread adoption of clinical practices to facilitate safe delivery cases in consonance with local and international (benchmarked) criteria, reduce complications, and monitoring and evaluating mother and child health programs.

This study comes to affirm the difficulty of utilizing of predictable standard birth measures, which are not applied in the overcrowded obstetrics and gynecology words at King Abdullah the Second Teaching Hospital at Just University, and the rising challenges of quality assurance and accreditation requirements that JUST's Hospital need to recognize to portray the distance between its current circumstances and what it might increase the focus on quality management and enhancement to advance evidence-based practice.

RECOMMENDATIONS

Conducting more academic scholarly activities to reinforce the accessibility and quality of information on births with periodical global comparisons can guarantee more successful and high-quality convenience instruments. The clinical guidelines for the management of mother and Child health programs should be regularly updated. Creating in-service and out-service training programs for the health workers to move forward their abilities. This article recommends that the newborn weight, head and chest circumference can be anticipated by the used theorem, thus, they are a basic pointer for mother and child well-being programs.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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