ORIGINAL ARTICLE

Correlation of Maternal Albumin Levels with Neonatal Birth Weight

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ABSTRACT

Objective: To correlate maternal albumin levels with neonatal weight.

Study Design: Cross-sectional study.

Place and Duration of Study: The study was carried out in Obstetrics and Gynecology unit and Laboratory of Railway hospital, Rawalpindi from June 2015 to March 2016.

Materials and Methods: Eighty-five mother -baby pairs were selected using systematic random sampling method, they were divided into two groups. Group I included mothers with serum albumin level in the acceptable range (3.5-5.0) gm/dl and Group II included mothers with serum albumin level less than 3.5gm/dl. Maternal venous blood was collected before delivery, serum was separated by centrifuge method. Information regarding the monthly income and dietary protein was recorded from patients. Quantitative in vitro determination of serum albumin was done by calorimetric biuret on photometric system. (Micro Lab).Birth weight of neonates was assessed using the laica weighing scale. Comparison of baby weight in group I and group II was done by Mann Whitney U test. p-value of < 0.05 was considered significant. Correlation of maternal albumin with baby weight was done by Spearman correlation.

Results: In Group I the median of 3.00 kg baby weight and in Group II the median of 2.30 kg baby weight. Spearman correlatin showed a significant correlation coefficient between maternal albumin and baby weight with p value less than 0.05.

Conclusion: The weight of the babies born to Mothers with serum albumin level < 3.5gm/dl was low as compared to the weight of the babies born to mothers with serum albumin level of (3.5-5.0 gm/dl).

Key Words: *Animal Protein, Maternal Albumin, Mother Baby Pair, Neonatal Weight.*

Introduction

The rate of low birth weight neonates have increased in the recent years. Metabolic demand increase in pregnancy. Reduced dietary protein during pregnancy causes decreased maternal albumin and low weight of babies. Nutritional reserves including protein , and vitamins are low in these babies.[1] Reduced baby weight leads to neonatal mortality, morbidity, subsequent growth and developmental retardation.[1]In developing countries women living in poverty have poor albumin status and are at increased risk of having low birth weight babies.[2] Identification before delivery of such mothers is important for the better outcome of babies. Serum albumin is the most abundant protein in human blood plasma. It is soluble and is produced in the liver.[3]It has a major role in modulating the distribution of fluids between compartments and keeps the plasma inside the blood vessels, also causes transportation of molecules including fatty acid to liver.[3]Albumin attaches to and carry bilirubin, drugs, thyroid hormone, it competitively binds with calcium, prevents photo degradation of folic acid and helps maintain the blood acidity in a narrow range.[4] Increased dietary protein intake promotes the synthesis of more albumin and raises albumin levels in the blood.[4]Albumin also has free radical scavenging ability. There is one free sulfhydryl group in albumin that reacts with thiol compounds and reduces inflammation.[5]During pregnancy one kilogram of extra protein is required with half going to the fetus and placenta and another half going to uterine contractile proteins, breast glandular tissue, plasma protein, and haemoglobin.[6] There is increased plasma volume by 50% and cardiac output by 30-50% leading to low albumin level.[7] Increased water retention causes reduction in plasma osmolality.[8] It has been reported that poor nutrition of mother and low albumin level in late gestation was associated with low birth weight in babies.[9] This decreased birth weight is an important determinant

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of infant mortality and morbidity worldwide.[10] Low albumin level in neonates is associated with various adverse clinical conditions, including necrotizing enterocolitis, and sepsis.[11]Diet rich in protein include meat, chicken , cheese, beans, lentils, milk , yogurt, eggs, nuts, and seeds.[12]If protein rich diet is given to the mothers during pregnancy it can improve the weight of neonates.[13]Present study was conducted to find out the level of maternal albumin and its relation with neonatal weight.

Materials and Methods

This cross-sectional study was carried out in the Obstetrics and Gynecology unit and Laboratory of Railway hospital Rawalpindi from June 2015 to March 2016. Eighty-five mother -baby pairs were selected using systematic random sampling method. Women of age more than 18 years and less than 45 years with single full term pregnancy based on fundal height or Naegele's rule.[14] Irrespective of any mode of delivery were included in our study. Women with pregnancy complications including intrauterine growth retardation, pregnancy induced hypertension, gestational diabetes mellitus, Rh , ABO incompatibility, sepsis or having twins or triplets at the time of delivery were excluded from the study. Information regarding socio economic status, belonging to urban or rural area, dietary proteins, antenatal care ,delivery outcome were collected The birth weight of babies in kg was recorded using the Laica weighing scale.[15] Babies weighing < 2.5 kg were considered as low birth weight babies and those weighing $\geqslant$ 2.5 kg were taken as acceptable birth weight for this study. Under aseptic technique two milliliters of maternal venous blood was collected and placed in vacutainer. Sera were separated from maternal venous blood by centrifuging these blood samples at 5000 revolutions per minute (rpm) for five minutes. The sera were used to estimate maternal albumin in (gram/dl) by using calorimetric biuret on photometric system. (Micro Lab).[15]All sera collected was kept in a refrigerator at -20°C until the time of maternal albumin assay. Statistical analysis was performed using statistical package for social science (SPSS) statistical software version 20, Statistical significance was defined as a p value <0.05. Correlation of maternal albumin with baby weight was done by spearman correlation method.

Results

Table I shows 51 mothers in group I and 34 mothers in group II. Comparison of baby weight in group I and Group II was done by Mann Whitney U test which showed in group I the median IQR of baby weight was 3.00 (2.80-3.50) kg and in group II the median IQR of baby weight was 2.30 (2.23-2.50) kg. This comparison showed a significant difference with p value less than 0.05. Mann Whitney U test indicated that increased maternal albumin causes increase in baby weight. Table II shows the correlation of maternal albumin with baby weight by Spearman Correlation showing rho value of 0.71 and indicating a significant correlation between maternal albumin and neonatal weight with p value less than 0.001.

Table III shows that 40 % of women in group I were taking animal protein and 60% were taking non animal protein. In group II 80% of women were taking animal protein and 20% were taking non animal protein.

Thus from the above results we can say that group I mothers with acceptable albumin level had improved baby weight as compared to group II mothers with low albumin level and low baby weight. Most mothers in group I were taking non animal protein while majority of mothers in group II were taking animal protein.

Table I: Comparison of baby weight in Group I and Group II by Mann Whitney U Test

Parameter	Group I (n=51)	Group II (n=34)	P-value
Baby weight (Kg)	3.00 (2.80-3.50)	2.30 (2.23-2.50)	0.00***

Group I = Albumin level (3.5-5.0) gm/dl
Group II= Albumin level < 3.5 gm/dl
***p<0.05 is considered significant

Table II: Spearman Correlation of Maternal Albumin with baby weight (n=85)

Parameter	Both Groups	
Maternal Albumin	*p*-value	rho
Baby Weight	0.00***	0.71

***p<0.001 is considered significant

Table III: Frequency distribution of animal and non animal protein in both groups

Albumin	Animal protein	Non animal protein
Group I	40%	60%
Group II	80%	20%

Discussion

In the developing countries the relationship between maternal albumin and birth weight outcome of neonates is of major public health importance. In this study, majority of neonates and mothers had acceptable birth weight and maternal albumin respectively. Similar observation was made by Baba usman et al., 2010 who observed high percentage of mother-baby pair with acceptable maternal albumin levels and birth weight of babies. He further attributed that this high percentage is a good indicator not only of mother's health and nutritional status, but also of the good outcome for survival, growth, long-term health and psycho social development of babies.[15] In our study it was seen that neonates (34) in number had low weight and their mothers were having albumin level < 3.5 gm/dl. Saleem,2014 in one of his study said that reduction in nutritional diet of mother causes intrauterine stress and disturbance of metabolic system leading to reduction in baby weight.[16] Rucker et al.,2011.in one of his research said that health insults in utero may lead to greater physiological deterioration of metabolic and immune systems.[17] These less weight neonates develop many diseases in adult life, Carlos et al., 2013 concluded that low baby weight and under-nutrition in utero causes adult diseases with fetal origin.[18] Eriksson, 2005 said that neonates with low weight are at increased risk of obstructive lung disease, high blood cholesterol and renal damage.[19] Betty et al., 2010 suggested that intrauterine stress also contribute to the risk of increased blood pressure in later life.[20] In our study neonates (51) in number had acceptable weight and their mother were having albumin level in the acceptable range 3.5-5.0 gm/dl. About 60% of these mothers were taking diet containing cereals , beans, milk, yogurt and vegetables frequently and fish, beef, mutton and chicken once a month. Most of these mothers belonged to rural areas and had a monthly income of less than 50,000 PKR. The mothers with low albumin level mostly belonged to urban area and had monthly income of more than 50,000 PKR, 80% were frequently taking beef, mutton, chicken, potatoes in their diet and were seldom taking cereals, beans and vegetables. The percentage of usable protein in Beef, meat and poultry is 20-40 %. Vegetables 75-80%, rice 85-90%, dairy products 80-90%, cereals and beans 60-70 %.[21] Animal products contain less protein as compared to dairy and vegetable products. Animal products contain all the essential amino acid but not in the concentrated form as compared to vegetables and beans.[21] Chris et al., 2007 in one of his study suggested that amino acids increased whole-body protein synthesis including albumin. Albumin function as building blocks for bones, muscles, cartilage, skin, blood, enzymes and hormones.[22] According to Neil osterweil., 2016 albumin is also used for building and repairing tissues.[23] It is seen in our study that neonates of the mothers of group II had low weight, Improving the maternal albumin level will increase the weight of neonates as albumin act as a building block for many structures of body and causes tissue growth and repair . In our study a positive correlation is seen between maternal albumin and neonatal weight indicating that increased maternal albumin is associated with increase in neonatal weight. The mothers belonging to low income class can easily buy the diet containing non animal proteins and had high albumin level indicating that vegetables and cereals proteins improves maternal albumin and neonatal weight more as compared to animal protein.

Conclusion

It is seen that Maternal albumin is directly proportional to neonatal weight and a positive correlation exists between maternal albumin and neonatal weight. For the better outcome of growth of neonates it is essential that mothers should be advised to take proper protein diet during pregnancy including cereals and vegetables in increased amount as compared to animal protein. This will improve the albumin of mother and weight of neonates preventing them from intrauterine neonatal stress and disease of fetal origin.

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