DISCUSSION
4.0 DISCUSSION

In the developing countries like India, the health and nutrition of women throughout their life are affected by complex and highly interrelated biological, social, cultural and health service-related factors. (Jose and Penelope, 2000). Good maternal nutrition is important for the health and reproductive performance of women, survival and development of their newborn. On such background considerations the present study has been undertaken to study the influence of maternal socio-economic status, maternal anthropometry and maternal serum elements on the pregnancy outcome i.e., the infant birth weight. The maternal hair, urine and umbilical cord serum elements, infant and maternal anthropometry have also been analyzed.

In the first part of the results, descriptive statistics has been performed along with the 't' test to find out the elemental levels of maternal serum, hair, urine, umbilical cord serum, infant and maternal anthropometry.

The results obtained from the present study indicate the direct influence of maternal serum Zn content on the health of the mother and on the infant birth weight in certain income groups. To back up the observations made, Kynasty et al.,(1986), Meadows et al.,(1981), Simmer and Thomson (1985) stated that maternal serum Zn levels affect both maternal health and the weight of the newborn.

In the HI and MI group of rural population and HI , MI and LI group population of urban shows inverse relationship between maternal serum Zn and the infant birth weight. In accordance to the inconsistency in the results of the present study Tamura et al.,(1996) in their review “Zinc nutritive and pregnancy outcome” have concluded that the findings in the literature reveal that the cause of inconsistency
in maternal serum Zinc levels is prevalent among the different sectors of people and in different residential regions.

Maternal serum Cu also shows the relationship similar to Zn. In certain income groups the maternal serum Cu content influences the infant birth weight directly and in certain income groups. Cu content and infant birth weight are inversely related. Hall and Howell (1969) Cerlewski (1979), Tuttle et al.,(1985) O’Leary (1966) and Artal et al.,(1989) showed the positive relationship between serum Cu levels maternal health and infant birth weight. Hill and Matron (1970) and Van Campen (1969) have discussed the existence of antagonism between Cu and Zn in the maternal system and this mineral interaction may influence the maternal health and in turn the infant birth weight.

Jacobson (1992) showed that higher infant birth weight resulted from the exposure of the pregnant women to high levels of Li. In the present study it has been found that the metropolitan population has shown higher Li levels and increased infant birth weight. This relationship is absent in the rural & urban population.

Calcium is necessary for foetal bone mineralization and the maternal demand for Ca during pregnancy is elevated to such high levels as 300mgdl (Reevee, 1980). Smolarczyk et al 1996 have discussed Ca supplementation during pregnancy reduced the risk of PIH (pregnancy Induced Hyper tension) and trails of Ca supplementation benefits in reducing the risk of hypertension and low infant birth weight.

According to Ritchie et al., (2000) the reason for the biochemical abnormalities in Pregnancy Induced Hypertension (PIH) / Impaired Ca absorption/ in adequate dietary calcium intake during pregnancy was not clear. The studies of Bucher et al.(1996),Godfrey et al,(1994),Campbell et al,(1996) and Belizan,(1997) have
said that Pregnancy induced Ca deficiency increases the absorption of supplemented Ca.

In the present study, higher levels of maternal serum Ca and the higher infant birth weight have been observed in the HI groups of the rural, urban and metropolitan populations. In a few observations it is noted that lower Ca levels indicating higher infant birth weight and higher Ca levels indicate high infant birth weight. From the above study and observations it is concluded that Ca alone is not the only determining factor of infant birth weight but other factors such as mineral interaction, pregnancy induced hormonal imbalance and genetic characteristics of the individual may be the factors influencing infant birth weight. Ca supplementation can be recommended throughout the reproductive phase of women.

Fawcett et al. (1999) have reported that Mg has an established role in the field of obstetrics. However, clearer understanding of the mechanisms of its actions in pregnancy and pregnancy outcome is yet to be established. Sanders et al. (1999) observed that Mg is involved in blood pressure regulation and in maintaining the normal functions of certain enzymes. They also noted the decrease in serum Mg concentrations in the PIH of pregnant women, which in turn affect the infant birth weight. Skajaa et al. (1991) stated that Mg supplementation was not recommended for populations with relatively good socio-economic status, which provide protection against fatal foetal outcome. The present study gave the picture that maternal serum Mg level may be a responsible factor which increases the infant birth weight in MI and LI groups of metropolitan population. Whereas slight inconsistency are noted in Mg levels to that of the infant birth weight in other income groups belonging to urban and rural population. Repke (1991), Borella et al. (1990) and Brommage et al. (1990)
have showed the non-uniformity of Mg concentration and infant birth weight, which may be due to the interaction between the various nutrients present in the maternal diet.

Arshad et al. (1998), Bothwell et al. (1979), Godfrey et al. (1991), Scholl et al. (1992) and Agarwal et al. (1991) have stated that Fe deficiency and anemia during pregnancy have resulted in infant low birth weight (ibwt). A developing foetus draws Fe from the mother, which amounts to about 200-300 mg at a term, which indicates the extra Maternal Fe requirement throughout the gestational period. Health and Welfare Canada (1990) states that the additional Fe requirement by the mother during pregnancy is noted due to the increased RBC mass in the foetal and placental system. The Maternal Fe deficiency anaemia and their influence on infant birth weight and foetal death were stated by certain authors (Blot et al., 1982, Scholl et al., 1992, and Duthie et al., 1991).

From the results it is concluded that the lower Fe levels and higher birth weight are noted in the LI group of urban and rural populations. In other income groups this relation is slightly inversed. The non-uniformity in the results suggests that there may be hormonal/mineral interactions/worm infestation/vasoconstriction in the maternal system.

From the present study it is observed that TIBC (Total Iron Binding Capacity) is low in the LI groups of rural population when compared to the other income groups of urban and metropolitan populations. Ahlan and Olayide (2000) revealed that the variation in maternal serum TIBC levels in different geographical areas may be due to environmental influences and nutritional habits. The same authors have emphasized
the need to define the exact mechanism for the functional role played by maternal
TIBC throughout the gestational period.

Observations have been made on non-uniform relationship between the
maternal serum P and infant birth weight in rural, urban and metropolitan populations
Brommage et al. (1990), Smolarek et al. (1997) and Wojcicka et al. (1998) have showed
the existence of homeostatic mechanism of Ca-P-Mg in the maternal serum. They
have also stated that the maternal serum P levels are elevated in the hypertensive and
preclamptic behavior of the pregnant women.

Na content of maternal serum in metropolitan population coincides with the
increased birth weight but this relationship is not observed in the rural and urban
populations. The difference in the relationship between maternal serum Na and infant
birth weight may be due elemental interactions and nutritional status and the altered
metabolic functions during the pregnancy period. Fränx et al. (1999) stated that a
strong positive association is existing between the sodium and the blood pressure of
normal human system but the relationship between Na intake and blood pressure in
human pregnancy is remaining obscure up to date. Unger et al. (1998) suggested the
non-relationship of low salt diet of mothers and infant birth weight According to the
above statements; the inconsistency in Na levels may be strongly attributed to the
nutritional uptake difference in and among the populations. Restricting the salt in the
diet of the pregnant women may be re-analyzed at this juncture.

The relationship between maternal serum K and the infant birth weight is not
uniform in all the other income groups of the same population as well as urban and
rural populations (Tomala et al., 1994). As a support to this statement, the present
study have reported that apart from the effect of serum K content during pregnancy,
the social status, lifestyle and biochemical changes have also been found to influence
the health of pregnant women and in turn the pregnancy outcome.

Urinary elements (Zn, Li, Ca, Na, and K) were analyzed and compared with
maternal serum elements (Zn, Li, Ca, Na, and K). From the observations it is found
that inconsistent results were observed for the maternal serum elemental levels and
urinary excretory elements in certain income groups but not in all income groups.

In the LI group of metropolitan population increased Zn urinary excretion and
in the LI Group of urban population lower level of Zn excretion is observed. In
supportive to our study Smith et al (1998) have stated that high urinary Zn excretion is
an indication of higher serum Zn content.

Ellenhorn and Barceloux (1998), Hullin et al (1968) and Bediles (1994) have
observed that excess Li exposure increased the serum Li content which is marked by
increased Li excretion, via urine. In rural and urban populations the relationship
between the maternal serum and urinary Li shows non-uniformly. This may be due to
the metabolic alterations among the minerals found during the gestational period.

Homeostatic mechanism is existing between Ca-P-Mg (Singh et al, 1999,
Suarez et al, 1999 and Ramos et al, 1998) have been reported in the observations of
above the mentioned authors. K-Mg-Na interactions lead to the osmoregulatory
mechanism between maternal blood K-Na and urinary excretion of the same elements
in a balanced manner. In this study variations have been observed in the maternal
serum, Ca, Na and K content to that of urinary Ca, Na and K excretory levels. This
may be due to the homeostatic and osmoregulatory functions of the maternal system.

Hair mineral analysis is not commonly accepted Orthodox medicine. Even
though controversial opinions exist among the researchers on human hair elemental
analysis, the United States Government has declared hair elemental analysis as a valuable testing method for community health studies (Blaurock – Busch 2001). Bax (1981) showed a strong correlation between the elemental concentration of hair and the internal organs especially blood levels. Studies conducted by Huel et al. (1981), Gibson and Gage (1982), Randall and Gibson (1989) have reported that the maternal hair elemental status is influenced by the concentrations of the elements in maternal organs, absorption dynamics, diets and environmental exposures. In the present study, variations have been observed between the serum elemental levels and hair elemental level in and among the income groups and among the populations. In corroboration to the present findings, Batzerich (1995) has concluded that the concentrations of the hair elements are highly inconsistent because of the local environmental setup, which makes social and ethnic identification impossible through the hair elemental analysis.

Schrømvel et al. (1988), Bratter (1996) and Schumacher et al. (1996) have reported that the elemental concentrations in the umbilical cord blood will reflect the elemental status of the mother and it is quite evident that the elements are consumed by the foetus during pregnancy through the placental uptake (Krachler, 1999).

In this study, analysis has been made on Zn, Cu, Li, Ca, Mg, Fe, TIBC, P, Na and K of umbilical cord serum. To conclude the findings it is inferred that in the LI group of rural population, a similarity exists in between the elemental content between the maternal and umbilical cord serum. The similarity is less in the other income groups and populations. Socio economically backward rural maternal population can be focused for the elemental nutrition intervention programmes.
The results presented in table 47 reveals a positive correlation between the maternal and umbilical cord serum elements however uniformity in correlation has not been observed in all the income groups.

In rural LI group all the elements are highly correlated which is followed by the MI and LI group. In the urban and metropolitan population very poor correlation has been observed especially in the HI and MI groups.
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Element</th>
<th>Rural</th>
<th>Urban</th>
<th>Metro</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>H</td>
<td>M</td>
<td>L</td>
</tr>
<tr>
<td>1.</td>
<td>Zn</td>
<td>0.683**</td>
<td>0.934**</td>
<td>0.998**</td>
</tr>
<tr>
<td>2.</td>
<td>Cu</td>
<td>0.020NS</td>
<td>0.492**</td>
<td>0.932**</td>
</tr>
<tr>
<td>3.</td>
<td>Li</td>
<td>0.049NS</td>
<td>0.036NS</td>
<td>0.737**</td>
</tr>
<tr>
<td>4.</td>
<td>Ca</td>
<td>0.108**</td>
<td>0.442**</td>
<td>0.709**</td>
</tr>
<tr>
<td>5.</td>
<td>Mg</td>
<td>0.161**</td>
<td>0.788**</td>
<td>0.964**</td>
</tr>
<tr>
<td>6.</td>
<td>Fe</td>
<td>0.741**</td>
<td>0.898**</td>
<td>0.938**</td>
</tr>
<tr>
<td>7.</td>
<td>TIBC</td>
<td>0.223**</td>
<td>0.927**</td>
<td>0.993**</td>
</tr>
<tr>
<td>8.</td>
<td>P</td>
<td>0.058**</td>
<td>0.539**</td>
<td>0.878**</td>
</tr>
<tr>
<td>9.</td>
<td>Na</td>
<td>0.002NS</td>
<td>0.003NS</td>
<td>0.887**</td>
</tr>
<tr>
<td>10.</td>
<td>K</td>
<td>0.045NS</td>
<td>0.108**</td>
<td>0.928**</td>
</tr>
</tbody>
</table>

** Significant at 1% probability level
* Significant at 1% probability level
NS- Not Significant
Cu in HI group and TIBC and P in MI group of metropolitan population are significantly correlated. In contrast to this, in LI group of the same population, Li, Mg and Fe are highly correlated. In accordance to the findings, Krachler (1999) has showed the active transport of the elements from the mother to the foetus. Aslam (1992), Waalkes et al. (1984), Goyer and Page et al. (1988) explained that the transfer of the maternal elements to the foetus via umbilical cord may be influenced by the placental uptake, utilization, placental-elemental binding proteins, placental metabolism and placental blocking effect. From the observations it is concluded that the active transport of the Maternal elements have been occurring via umbilical cord to the foetus in the rural population than the urban and metropolitan population. This may due to the life style, social cultural factors and physical activity undertaken by the rural population.

Infant height, Head, chest and mid upper arm circumferences did not show uniform in relationship with infant birth weight in all the income groups.

Gueri (1977) have suggested that combination of both MUAC and chest circumference was of little value in predicting the infant birth weight. Ramachandran and Kumar (1986) and De Vaquero (1983) have stated that mid-upper arm and chest circumferences were successful in predicting infant birth weight. At this point, further research could be undertaken to identify the appropriate infant anthropometric measurement to determine the infant birth weight.

Maternal anthropometric measurements are not uniform in all the income groups and among population. In HI group of metropolitan population the increase in height and weight of the mothers shows positive relationship with increased infant birth weight. However, in other income groups and population this relationship is not
convincing. Division of Family Health, WHO (1991) suggests that the application of maternal anthropometry in predicting the infant birth weight, is limited. It also discusses that the maternal anthropometric measurements are particularly useful in identifying women with nutritional problems, which in turn affect the pregnancy outcome.

Kardjati (1988), Miller (1951), and NIN / ICMR (1982; 1983) showed the existence of positive correlation between the maternal height and infant birth weight (Mortorell, 1981). In contrast to this, based on the U.S data division of Family Health, WHO 1991 indicated that maternal height couldn't be used to predict infant birth weight. Hence, further biological research is needed on the relationship between the specific anthropometric indicators on infant birth weight.

Student 't' test was performed between the HI, MI and LI groups of rural, urban and metropolitan populations for maternal serum, urine, hair and umbilical cord serum elements. In addition to this, 't' test was also performed for infant and maternal anthropometry. From the results it is understood that the majority of the elements show similar correlation and few elements do not show the similarity in and among the income groups and populations. The same results are observed for the infant and maternal anthropometry among the income groups and populations.

In the second part of the result section, the observations are obtained from the health care models. These models are adopted to predict the birth weight of the infants delivered by the mothers belonging to the various geographical areas of low-middle and high-income groups. Multiple Linear Regression Models (MLR) has analyzed the most effective and influencing factors on infant birth weight.
First MLR model was proposed to select the maternal anthropometric and socio-economic parameters, which is more important in predicting the infant birth weight. It is concluded that the health and the height of the mother is the predicting factor of infant birth weight in the rural population. In the urban population maternal height, weight, age education and health of the mother are the best predicting factors for HI, MI and LI group respectively. In the metropolitan population, the observations are similar to that of rural population, i.e. maternal height and health and in addition maternal education also plays an important role in predicting infant birth weight. In accordance to this study, Kushwaha (1993), Kramer (1987), Gopalan (1994) and UNICEF (1996) have showed the adverse effect of adolescent (10-18 years) pregnancies on infant birth weight. Menken and McCarthy (1979), Furstenberg (1976), Peter et al. (1989), Card and Wise (1978) and Menken (1972) in their studies documented the negative social, economic and health sequences for women who bear children during the adolescent years. Lobi Welcher and Mellits (1971), Chase (1983), Douglas (1950), Battaglia et al. (1968), Hardy et al. (1978) and Osofsky and Kendall (1973) found a positive relationship existing between the maternal age and the infant birth weight Pearila and Phyllis (1981), and Sandlers (1979) in their studies found no positive relationship between the maternal weight and infant birth weight. However, WIC (1984) reported the increased supplemental food programme for low-income rural women showed an appreciable increase in infant birth weight. Division of Family Health, WHO (1991) stated that weight for height is considered to be good predictors for infant outcome.

In support to the present findings WHO (1995), Barker (1992), Goldberg and Prentice (1994), Amin et al. (1993), Husaini et al. (1995) and Taneja et al. (1994) in their
studies demonstrated that maternal weight influence the health of the mother which in turn is important in determining the infant birth weight. Priti and Manisha (1998) suggest the importance of awareness programmes in rural areas where people are not aware of maternal health and pregnancy outcome.

Keeping the above observations in mind, it is concluded that the health of the mother in the rural HI and LI groups, socio-economic and maternal anthropometric parameters of HI, MI and LI groups of urban population and maternal health in HI and MI and maternal education in LI group of metropolitan population should be taken into consideration for the health-policy framing programmes and various remedial systems to upgrade the reproductive health of the women.

Second MLR model was proposed to understand the influence of maternal serum elements (Zn, Cu, Li, Ca, Mg, Fe, TIBC, P, Na and K) on infant birth weight. Stanstead (1995), Wathen et al. (199), Block and Abrams (1993), Belizan (1999) in their studies stated that the maternal elements have a positive influence on infant birth weight. In the above observations it has also been concluded that in the MI group of rural and urban populations and in HI group of metropolitan population the majority of the elements have predicted the infant birth weight in a higher degree when compared to the other income groups. It is suggested that the elemental prophylactic systems should be introduced from the time of adolescent period onwards to the above mentioned income groups of the specific populations mentioned to improve the maternal health and pregnancy outcome.

Third MLR model was undertaken to predict the influence of maternal socio-economic status, anthropometry and maternal serum elements on the infant birth weight.
When compared to the previous two MLR models, the present model (MLR model 3) shows an effective prediction of the infant birth weight by the maternal anthropometric socio-economic and maternal serum elements groups of rural population.

In rural population, maternal health and the elements P & TIBC in HI group, Maternal height and elements in MI group and maternal age and elements in LI group are the predicting factors of the infant birth weight, age, health and elements in the HI group, maternal weight, height, health and elements in MI group and maternal weight, height and elements in the play an important role in predicting the infant birth weight.

In metropolitan population, maternal health, height and elements predict the infant birth weight in HI, MI and LI groups. In supportive to he present study, Chandra (1992) ICMR (1981) have stated the positive link between the maternal height and pregnancy outcome.

Jane et al (1977) showed ample evidence to indicate the role of socio-economic gradient in the incidence of infant low birth weight (<2.5 kg). Franz et al (1970) suggested that the foetal nutrition is concerned not only with nutritional factors but also with sociological, environmental, genetic, physical and cultural factors. Various aspects regarding the maternal health and pregnancy outcome may differ from country to country and from race to race. The difference and the impacts of maternal anthropometry, socio-economic status and serum elements on infant birth weight at different degrees may be due to the element toxicity, deficiency and nutritional requirements (Baker and Maeyer 1979 and Dallman et al 1980).

Hence, from the present findings it is suggested that, Maternal Socio Economic developments and elemental nutritional welfare programmes should be
initiated and executed among all the socio living areas irrespective of their already existing knowledge about pregnancy and pregnancy outcome.

In the fourth MLR model, infant anthropometry is taken as a predictor for the infant birth weight and the results. Bliss (1970), Draper and Smith (1981), Ngowi et al. (1993), Fawcus et al. (1993), Verma et al. (1995) in their studies considered the infant anthropometric measurements are easy and convenient tool to introduce into the existing system of health care in the community of developing nations and to be used by paramedical workers for predicting birth weight.

Significant correlations between the infant anthropometry and infant birth weight have been reported by various research workers (Bhargava et al. (1985); Bhatia and Tyagi (1984); Singh and Venkatachalam (1962); Saigal and Srivastava (1969) and Pachauri and Sharma et al. (1988).

In 1972, WHO reported that the infant chest and arm circumferences are the best predictors of infant birth weight in less developing countries. In this study it is observed that chest circumference and the MUAC (Mid Upper Arum Circumference are the predicting factors of infant birth weight in the HI, MI and LI group of rural population. In urban population, it is observed that the influencing factors are not uniform in the three income groups. In the metropolitan population also the anthropometric predictors for infant birth weight is not uniform in all the three income groups.

Sharma et al. (1988) has also used MUAC chest circumference and height, Ngowi et al. (1993) has also used chest and head circumference as the predictors of infant birth weight to substantiate the present observations. So, it is concluded that
infant anthropometric parameters cannot be applied in a generalized manner to predict infant birth weight across the country with different socio-economic status.

It has been observed that the health of the mother plays a vital role on the infant birth weight. Since the health of the mother is dichotomous in nature logistic model has been applied instead.

The Logistic Regression Model has been adopted to correlate the maternal health (hypertension/normal) with Maternal anthropometry and socio-economic status. Afifi and Clark (1984) Victor et al (1979) Peter et al (1989) and Jonathan et al (1981) have used Logistic Regression model to study the level of influence of maternal socio-economic and anthropometric status on maternal health and pregnancy outcome in various geographical areas and in different countries. From the results it is observed that age has an higher degree of chances to affect the maternal health in the HI group and type of marriage (relative) and type of delivery (Caesarean / forceps) to a lesser degree in the MI group. To corroborate the new findings Newman et al (1995) Richard et al (1989) Williams (1986) and Victor et al (1979) have showed that the maternal age is an important parameter in determining the maternal health and pregnancy outcome. Madani et al (1995) and Bhatia et al (1985) stated that age along with the socio demographic parameters has a greater impact on maternal health.

In the urban population, the HI and MI income groups show similar results like the rural population i.e. in both the income groups, age is having the higher chances of affecting the maternal health, which is followed by the type of delivery.

In the metropolitan population, maternal weight has an influence on maternal health in the HI group. In the LI group of rural, urban and metropolitan population age shows the higher degree influence on the hypertension occurrence in the pregnant
women. These results in table 34 (a-c) are not satisfactory in accordance with the test statistics used for logistic regression for better model fit. Further studies can be undertaken on these results, which is beyond the scope of the present study.

In the fourth part of the results “Factor Analysis” model has been adopted to analyze and interpret the maternal serum, urine, hair and umbilical cod serum elements which is highly influencing the health of the pregnant mothers belonging to HI, MI and LI of rural, urban and metropolitan populations.

From the results presented in table 35a-37c it is observed that the serum elements influencing the maternal health are not uniform income groups and among populations. In the LI group of rural population among Zn, Cu, Li, Fe, TIBC and P followed by Ca and Mg are the elements influencing the health of the pregnant mothers and in turn the pregnancy outcome.

The HI, MI and LI group of urban and metropolitan populations randomly show the influence of Fe, Cu, Na, Ca K , Zn , Mg P, Li on the health of the pregnant mother. According to Blaurock – Busch (2001) the importance of proper mineral balance is still under estimated, even though diligent research demonstrates the excess or deficiency or malabsorption may contribute to adverse effects on the health of the mother which in turn affects the infant birth weight. In the present study, it is suggested that the nutritional care, interventional programmes and elemental prophylactic systems should be introduced effectively in the LI groups of rural population which is followed MI and LI groups of urban and metropolitan populations. From the results it is recommended that focused rather than the generalized health care policies more useful for different socio-economic and population levels.
It is observed that in all the populations P is the common element, which is found to be heavily loaded in all the income groups, i.e., HI, MI and LI groups. Li and Na are heavily loaded in the HI, MI and LI group of urban populations. Li, Na and K are the heavily loaded elements in the HI, MI and LI group of metropolitan populations. These loadings indicate that the influence exerted by these elements on the maternal health is uniform in particular income groups and showed non-uniformity in certain income groups. Other elements i.e. Zn and Ca are randomly loaded in HI and MI group of urban and metropolitan population. Regarding the urinary excretion during the gestational period, depends on the homeostatic mechanism existing in between particular elements. Pregnancy induced hormonal mineral balance genetic and metabolic factor are also the other determining parameters for the excretion of the elements through urine.

Hence, further research is recommended to evaluate the relationship between the maternal serum and the urinary elements to assess health of the pregnant mothers and pregnancy outcome.

Blaurock – Busch (2001), emphasized the utilization of blood hair and urine mineral analysis for the physicians to diagnose and prevent problems before organic damage is serious even irreversible in certain geographical regions due to environmental problems.

The result of the present study reveals the various levels of the elemental accumulations in the maternal hair among the various socio economic and population levels. Hence the knowledge of the elemental exposures and its effects should be imparted among the HI, MI and LI groups of urban and metropolitan population and
among the MI and LI Groups of rural population can be adopted at an earlier period for betterment of the maternal health and pregnancy outcome.

Factor analysis for umbilical cord serum elements are performed for HI, MI and LI groups of rural, urban and metropolitan populations and the results are presented in table 44a - 44c. From the results, it is observed that in the LI group of rural population Zn, Cu, Li, Fe, TIBC and P are heavily loaded which is followed by Ca and Mg in the second factor. This is an unique observation in the LI groups of rural population when compared to random loadings of TIBC, Mg, Fe in HI and MI groups of rural populations, Zn, Li, Cu and Ca in the urban population and Mg, Na, K, Cu and P in the metropolitan populations. According to Schramvel et al(1988(a, b), Bratter et al(1991) Lombeck & Fuchs(1994) Frkonic et al(1996)and Schumacher et al(1996) the umbilical cord serum elemental content is the reflection of the maternal serum elemental level.

In the results are observed the elemental loading of maternal serum and umbilical are going in a similar way in the LI group of rural population which is followed by the MI and LI groups of urban and metropolitan population. Hence, from the above observations it has been concluded that the elemental impact in determining the infant birth is more in LI group of rural population, which is followed by the MI and LI groups of urban and metropolitan populations.

On securitization of the factor loadings of maternal serum, urine hair and umbilical cord elements, it is concluded that the impact of the elements in determining the maternal health and pregnancy outcome i.e. infant birth weight is to a higher degree in the LI group of rural population which is followed by the MI and LI groups of urban and metropolitan population. Health care measure, nutritional – prophylactic
systems should be focused on the above said sectors rather than introducing
generalized set up for all the socio economic strata among different population across
the country.