Chapter-V

Summary and Conclusion

A short summary of the results obtained from the study “The Effect of Selected Modifiable Maternal Risk Factors during Pregnancy on Early Childhood Obesity.” is discussed in this chapter. Data on birth outcome due to maternal pregravid BMI, race, age, infant birth weights, gestational diabetes, smoking and non-smoking mothers, Intake of fruit, vegetable, dairy products during a week, daily activity, screen time of overweight mothers, and children, and results of the observational study of overweight children were analyzed and summarized. Value conclusions drawn from the results of the study have been enumerated.

**FINDINGS OF PERCENTAGE ANALYSIS:**

- The result of maternal smoking mothers showed that 40.3 percent were in the category of normal weight. More than half of the (51.5 percent) smoking mothers had over weight and obese pregravid BMI.

- Among smoking mothers, the highest age group of smokers was young adults (41.1 percent) who were between 20 to 24 years old. followed by about 22 percent of teenagers who were below 19 years, and older adults who were 25 to 30 years and finally 13 percent were mid age smokers who above 30 years old. More than half of smoking mothers, (63.6 percent) fall under the categories of Teenagers, (≤ 19 years) and Young Adults (19 to 24 years).

- It was found that the highest (41 percent) age group of smokers were young adults who are between the age of 20 – 24, followed by about 22 percent of teenagers who were below 19 years, and older adults who were 25 to 30 years and finally 13 percent were mid age smokers who above 30 years old.
• Majority of smoking mothers, 67.1 percent had infants with normal birth weight, but 11.3 percent infants had lower birth weight and 21.6 infants had higher birth weight.

• More than half of the infants i.e., are 65.4 percent fell in the group of white race, and 32.9 percent infants were born to black smoking mothers.

• WIC program mothers of all categories of pregravid BMI showed that 39.8 percent had normal pregravid BMI, followed very closely by overweight mothers 30.5 percent. Total mothers with overweight and obese pregravid BMI were 59.8 percent and only 1.4 percent was underweight mothers.

• Highest group of WIC program mothers were 34.4 percent young adults and older and middle aged mothers were almost with equal distribution of 26.5 and 29.1 percent respectively.

• WIC program mothers who had infants with normal birth weight were 60.7 percent. Whereas there were 27.3 percent, mothers had infants with high infant birth weight and 12 percent mothers had infants with low infant birth weight.

• Infants born to white mothers were 57.5 percent, followed by 38.8 percent infants born to black mothers, only 2.2 percent infants were born to other races.

• Out of 5,620 Cobb County, Georgia 96.5 percent WIC program mothers were without gestational diabetes and 3.5 percent were mothers with gestational diabetes.

• WIC program mothers with overweight BMI have almost 2.1 times the odds of having gestational diabetes compared to WIC mothers with normal BMI. Increasingly followed by WIC mothers with Obesity Class I, have odds of 2.9 times, WIC program mothers with Obesity Class II, have odds of 4.6 times, and finally WIC mothers with Obesity Class III, have odds of 5.3 times the odds of having gestational diabetes.

• More than half of overweight WIC mothers i.e., 63.4 percent self-reported that they ate fruits daily, and 36.5 percent overweight mothers had fruits some time during the week.

• Similarly, 59.5 percent of overweight mothers ate vegetable daily and 40.2 percent of overweight mothers ate vegetable sometime during the week.
Out of 1001, WIC program overweight mothers 65.7 percent mothers included dairy products in their daily diet, and 34.3 percent mothers had some intake of dairy during the week.

Almost three fourth of overweight mothers i.e., 71.9 percent were under the category of some active and 24 percent were active mothers.

Overweight mothers who spent 0-2 hours of screen time every day were 70.8, followed by 26.2 percent of overweight mothers spent 3 to 5 hours, and 3 percent mothers spent 6 or more than six hours on screen time.

The distribution WIC program overweight mothers based on their pregravid BMI showed that 48.1 percent were in overweight category, followed by 30.7 percent mothers with obesity Class I, then 13.2 percent of mothers with obesity Class II, finally about 8.1 percent of mothers with obesity Class III.

Seventy two percent of overweight children reported that they ate fruits every day and 28 percent of children had fruits some time during the week.

Sixty percent overweight children stated that they ate vegetables every day and 40 percent of overweight children had vegetables only some time during the week.

Overweight children who included dairy products in their daily diet were 76 percent and 24 percent were children included dairy sometime during the week.

Eighty-eight percent overweight children fell in the group of very active children, and only 4 percent overweight children were in the category of some active. Eight percent overweight children were active during the week.

Forty-four percent overweight children spent 2 hours of screen time daily and twenty percent spent 3 hours of screen time. Similarly 20 percent were children who spend 1 hour screen time, finally 16 percent 4 hours screen time per day

Most of the WIC overweight children i.e., 68 percent were in the group of BMI 18-20 followed by 20 percent of overweight children with BMI of 20-22, and 8 percent of
overweight children with BMI 22-26, and finally 4 percent overweight children with BMI 24-26.

**Results on Average Analysis:**

- The mean pregravid BMI of smokers is 26.94 with Standard Deviation (SD) of 7.54. The mean age of smokers 24.65 with SD 5.21, their mean infant birth weight is 7.01 with (SD) of 0.97.

- Matched sample of mean of pregravid smoker’s BMI 20.94 with SD 1.95 and mean of pregravid non smoker’s BMI 20.59 with SD of 1.12, mean of age of smokers 24.15 with SD of 4.86, and that of non-smokers is 24.62 with SD 5.12. The matched sample of mean infant birth weight of smokers is 7.05 with SD 0.76 that of non-smoker’s mean is 7.43 with a standard deviation of 0.77. The average difference The average difference of 6.08 Oz (16oz = 1 pound) was observed between the mean infant birth weight of smokers and that of non-smokers (matched for age, pre-gravid BMI: 0.47yrs ± 0.35kg/M² respectively, and race).

- Matched sample of mean of pregravid white smoker’s BMI 26.45 with SD of 11.4 and mean of pregravid black smoker’s BMI 25.69 with SD 7.32. The mean of age of white smokers, 23.76 with SD of 3.4, and that of black smokers is 24.18 with SD of 3.5. The matched sample of infant birth weight mean of white smokers is 7.15 with SD 0.83, that of black smoker’s mean is 6.36 with a SD of 0.96. The average difference of 12.64 Oz (16oz = 1 pound) was observed between the mean infant birth weight of black and that of white smokers. (Matched for age, pregravid BMI: ± 0.47yrs, ± 0.35kg/M² respectively, & race).

- The mean infant birth weight of mothers who stopped smoking during the last three months of pregnancy still had infants with significantly lower mean birth weight than the mean birth weight of infants born to those who never smoked. Even though the mean infant birth weight (7.14# with SD 13.19) of smokers who stopped in the third trimester is lower than that of non-smokers (7.96# with SD 1.23of a matched sample),
this study shows that there is improvement on mean birth weight (7.14#) for infants of smokers who stopped at third trimester compared to the mean infant birth weight (7.05 #) of smokers who did not stop smoking during the third trimester of their pregnancy.

- The mean infant birth weight of maternal smokers’ children in 0 - 4 years on set of obesity study was 6.99 with standard deviation 1.04 and CV% was 14.88.
- The mean percentile of maternal smokers’ children- year 1- length/ weight in percentile was 17.9 with SD 1.96, and CV% 10.97
- Similarly the mean percentile of maternal smokers’ children - year 2- length/ weight in percentile was 18.27 with SD 3.93, and CV% 21.51
- Maternal smokers’ children of year 3- mean BMI in percentile was 17.74 with SD 2.73, and CV% 12.8
- The mean maternal smokers’ children - year 4- BMI in percentile was 17.24 with SD 2.08, and CV% 12.06.
- It was observed difference of mean initial BMI and final BMI of overweight children of the observational study was only 21.19 (SD 2.45) – 20.96 ( SD. 2.34) = 0.23. Multiple comparison CV% of overweight children BMI is almost equal with each other.

**Majority results from Chi-Square analysis:**
- The association between pregravid BMIof the smoking mothers and different levels of infant birth weight is not statistically significant. The calculated chi-square value is 11.52. More than half (67.1 percent) of infants of these mothers were of normal birth weight, 21.6 percent of infants with high birth weight, and 11.3 percent of mothers had infants with low birth weight.
- There was no significant association between the age of the smoking mothers and different levels of infant birth weight. The calculated chi-square value is 4.0. Mostly (67.1 percent) of all age smoking mothers gave birth to infants with normal birth
weight, however 21.6 percent infants born to maternal smokers were with high birth weights, finally 11.3 percent were infants with low birth weight.

- Similarly, the association between the race of the smoking mothers and different levels of infant birth weights was not significant. The calculated chi-square value is 6.282. Majority (67.1 percent) of infants was of normal birth weight, 21.6 percent were infants with large gestational birth weight, and 11.3 percent of mothers had infants with low birth weight.

- There is a very high significant association between pregravid BMI of WIC program mothers and different levels of their infant birth weight. The calculated Chi-Square value is 98.828. Most of WIC program mothers in category of pregravid BMI (60.7 percent) gave birth to infants with normal birth weight, 27.3 percent were infants with high birth weight, and 12 percent were infants with low birth weight.

- Similarly, the association between age group of the WIC program mothers and different levels of their infant birth weight is highly significant. The calculated chi-square value is 27.415. Majority (60.7 percent) of all age mothers gave birth to infants with normal birth weight, 27.3 percent were infants with high birth weight, and 12 percent were infants with low birth weight.

- There was no significant association between all race of the WIC program mothers and different levels of infant birth weight. The calculated chi-square value is 8.626. Mostly (60.7 percent) of WIC mothers of all races gave birth to infants with normal birth weight, 27.3 percent were infants with high birth weights, and 12 percent were infants with low birth weight.

- The association between different races of WIC program mothers of all pregravid BMI categories was highly significant. The calculated chi-square value is 138.2.
There was no significant association between mean infant birth weight of WIC program mothers with or without gestational diabetes. The calculated chi-square value is 3.032.

Similarly, the association between pregravid BMI of overweight mothers and intake of fruits during a week was not significant. The calculated chi-square value is 7.915. More than half (63.4 percent) of overweight mothers were in the category of ‘Daily Intake’, followed by 36.5 percent in category of ‘Some Intake’, only 0.1 percent were in the category of ‘Do not Take’

There was no significant association between pregravid BMI of overweight mothers and intake of vegetables during a week. Mostly (59.5 percent) overweight mothers were in the category of ‘Daily Intake,’ followed by 40.2 percent in category of ‘Some Intake,’ only 0.3 percent were in the category of ‘Do not Take’

Association between pregravid BMI of overweight mothers and intake of dairy products during a week was not significant. The calculated chi-square value is 1.681. Majority of 65.7 percent overweight mothers were in the category of ‘Daily Intake’ followed by 34.3 percent in category of ‘Some Intake.’

There was very high significant association between pregravid BMI of overweight mothers and their daily activity during a week. The calculated chi-square value is 13.05. More than half (71.9 percent) of overweight mothers were in the category of ‘Some Active’, followed by 24 percent in category of ‘Very Active’, only 4.1 percent mothers were in the category of ‘Not Active’

The association between pregravid BMI of overweight mothers and screen time during a day was not significant. The calculated chi-square value is 8.557. Majority (70.9 percent) of overweight mothers were in the category of ‘0-2 hours’ of screen time
per day, followed by 26.2 percent were in category of ‘3-5 hours’, only 3 percent mothers were in the category of ‘6 hours and above’

- There was no significant between BMI of overweight children and intake of fruit during a week. Seventy-two percent overweight children were in the category of ‘Daily Intake’, followed by 28 percent were in category of ‘Some Intake’.

- Similarly, the association between BMI of overweight children and intake of vegetable during a week was not significant. The calculated chi-square value is 2.426. Sixty percent children were in the category of ‘Daily Intake’, followed by 40 percent were in category of ‘Some Intake’

- Association between BMI of overweight children and intake of dairy intake during a week was not significant. The calculated chi-square value is 2.135. Seventy six percent overweight children were in the category of ‘Daily Intake’, followed by 24 percent were in category of ‘Some Intake’

- Association between BMI of overweight children and daily activity during a week was significant. The calculated chi-square value is 12.87. Eighty eight percent overweight children were in the category of ‘Very Active’, followed by 4 percent were in category of ‘Some Active’, only 8 percent mothers were in the category of ‘Active’

- Association between pregravid BMI of overweight children and screen time during a day was not significant. The calculated chi-square value is 5.37. About 44 percent overweight mothers were in the category of 2 hour of screen time per day, followed by 20 percent were in category of 1 hours, and 3 hours, categories. Sixteen percent children spent 4 hours of screen time per day.

**Majority Results with Z –Test:**
Comparison of the mean with the SD of infant birth weight of smokers and non-smokers. The Z value was 6.433 and it was highly significant.

Comparison of the mean with the SD of infant birth weight of white and black smokers and non-smokers. The Z value was 4.63 and it was highly significant.

The Z value was 1.89 and it was not significant on comparison of the means with the SD of infant birth weight of normal and underweight mothers.

When the means with the SD of infant birth weight of normal and overweight mothers was compared, the Z value was 1.92, which was not significant.

Comparison of the means with the SD of infant birth weight of normal and mothers with obesity Class I showed the Z value to be 6.85, which was highly significant.

Similarly, the Z value of 7.27 was highly significant when comparison of the means with the SD of infant birth weight of normal and mothers with obesity Class II was done.

The Z test was done comparing the means with the SD of infant birth weight of normal and mothers with obesity Class II. The Z value was 617 and it was highly significant.

Phase III results: Analysis of variance (ANOVA) was done on BMI of overweight children during their five clinical visits. It was observed that there is no significant variation between the overweight BMI during different months of intervals.

In Phase III, a Dunette’s Test was done on BMI of overweight children during their five clinical visits. It is observed that there is no significant variation between the reference Group that is initial overweight BMI and overweight BMI during different months of intervals.

**Recommendation:**

- In this study, it was observed that 51.1 percent smoking mothers were overweight and obese and 11.3 and 29 percent of smoking mothers of all BMI categories, ages, and races gave birth to infants with lower or higher than normal infant birth weight respectively. So it
is highly recommended to reduce this impact with targeted provision on prenatal nutritional counseling.

- Based on the evidence of this study, the impact of smoking on infant birth weight of white and black mothers must be emphasized. Infants born to smokers had low birth weight than that of non-smokers, and the same was observed with infants born to black mothers in comparison with white mothers.

- It was scientifically evident from this study result, that cessation of smoking at any level, before, during or after pregnancy is beneficial to improve the infant birth weight. So this information is highly recommended as a part of nutrition education.

- Similarly based on the evidence of this study, smoking during pregnancy can lead to childhood obesity and maternal overweight. This scientific evidence is highly recommended as a part of nutritional counseling session for mothers of childbearing age. This in turn can impact on nation’s reduction of uterine onset of childhood obesity.

- There is evidence that pregravid BMI of mothers with all categories has direct impact on infant birth weight, it was found that as the pregravid BMI increase, the infant birth weight increased. So it is recommended that mothers of childbearing age through effective nutritional counseling should be encouraged to maintain normal BMI, and optimum maternal weight gain during their pregnancy especially WIC program mothers.

- The observational study of overweight children evidenced that with a provision of enhanced nutritional counseling strategy by same clinical nutritionist, on a continuous manor, enabled the overweight children to reach their optimum body weight by putting on height without gaining weight. This clinical practice helps significantly to reduce childhood obesity. So benefits on behavioral changes through this enhanced nutritional counseling strategy should be highly recognized and recommended as a part of diet therapy during nutritional counseling session of nation’s WIC program. Thus developing emotional trust and rapport is a milestone for medical nutritional counseling therapy.
• In this study, there was evidence that the provision of continuous means to increase the knowledge through different educational tools such as power point presentation, journal club, and pamphlets are highly beneficial for diet professionals. So this process of knowledge provision in work place is recommended for professional development of Registered Dietitians, which directly impact the health benefit of the clients.

• The continuity of education concept among the public health dietitians increases the confidence of their knowledge and professional competency. So orientation modules with current journals and questions as competency assessment tool are recommended for Registered Dietitians.

• In this study Asian community was studied in such a manner that research can be applicable all Indian population in U.S and India.