

# Pre and Probiotic Intervention Package for Better Gut Health and Improved Immunopotency among Expectant Mothers

N. Maragatham\*

Associate Professor, Nutrition and Dietetics, Vellalar College for Women, Erode – 638012, Tamil Nadu, India; sahanajansi@gmail.com

## Abstract

Diet rich in probiotics and prebiotics are essential for the maintenance of normal health of individuals in all stages of life. The present study aimed to provide counseling to the pregnant women in order to improve the intake of functional foods. Deworming of the selected pregnant women was done in two stages and they were supplemented with probiotic multiguard capsules. Avoidance of junk food and regular intake of curd based recipes showed beneficial effects.

**Keywords:** Probiotics, Prebiotics, Deworming, Junk foods, Functional foods, Expectant mothers

## 1. Introduction

Probiotics requires the presence of non-digestible carbohydrate. Prebiotics food intake is for good existence and growth. The combination of probiotics and prebiotics is called as a symbiotic. Mostly fermented foods are said to be symbiotic in potential.

Probiotics are rich in yogurt, and prebiotics are found in whole grains, bananas, onions, garlic and honey. Probiotics and prebiotics can be combined as food supplements. Such type of foods are efficient enough to cure vaginal infections, urinary tract infections, bowel related irritation syndrome, intestinal bacterial and fungal infections, throat infections etc. Side effects with the intake of pre and probiotic dietary supplements are found to be rare.

Probiotics is a must during pregnancy and beyond. Having a strong and healthy gut is important for both mom and baby. Taking a high-cultured probiotic is a step in the right direction to support the immunity of

both mom and baby. In fact, many studies have found adding probiotics to the mother's supplement regimen before conception has even greater benefits for the baby. Studies show that the mothers who increase their probiotic intake during pregnancy can reduce their child's risk of allergies by as much as 50 percent and specifically in eczema, asthma and atopic dermatitis. Mom benefits by decreasing her risk of colds and respiratory infection, reduces the risk for preeclampsia, helps to lose postpartum weight faster, aids in digestion and nutrient absorption and reduces the risk for postpartum depression. Hence the present study was undertaken with the following objectives to replace the junk foods with pre-probiotic snacks among expectant mothers, to supplement the expectant mothers with multiguard vitamins capsules, to assess the immunological, nutritional, clinical, biochemical and hematological parameters before and after supplementation and to establish pre and pro-biotic intervention health package (Probiotic like curd recipe book+powerpointCD+deworming tablet) for better

\*Author for correspondence

immunopotency among the female community in India for better reproductive, maternal and neonatal health.

## 2. Methods and Materials

### 2.1 Selection of Area

The present project study was conducted in Jai Maruthi Maternity Hospital, Erode, Tamil Nadu. Interview with the subjects, deworming, supplementation of multiguard tablets, supplementation of curd recipe, collection of blood samples, analysis of blood samples were undertaken in the hospital.

### 2.2 Selection of Subjects

Two hundred and fifty pregnant women who were in the third trimester of pregnancy attending the hospital for regular check-up in the selected area were included for the study. Medical guidance and technical support was obtained from the experienced medical practioners and well trained clinical laboratory technicians for interview, medical examinations, sample collection and analysis.

### 2.3 Collection of the Blood Samples

Blood samples were collected from the expectant mothers (n = 250) and analysed for immunological and biochemical parameters.

### 2.4 Assessment of Basic Knowledge on Junk Foods and Probiotics

Questionnaire method was adopted to obtain information on knowledge about the adverse effects of

junk foods, health, infectious diseases, intestinal worms and pre/pro biotic foods and details of nutritional, clinical, hematological, immunological and biochemical parameters from the selected subjects.

### 2.5 Deworming of Expectant Mothers

With the guidance of gynecologist deworming session was organized in two stages for all the selected subjects.

Composition of the deworming capsules is Albendazole - 500 mg (single dose).

### 2.6 Supplementation of Probiotic Multiguard Capsule

All the selected dewormed subjects were provided Multiguard Probiotic Capsule (single dose/day for 3 months) in phase I, followed by natural prebiotic and probiotics food supplementation (unrestricted intake of homemade curd recepie - Table 1) in Phase II for a period three months. Counseling was given to avoid junk foods and to include functional foods.

Multiguard capsules aid in the enhanced growth of probiotics in the existing intestinal temperature. Each capsule contains approximately four types of micro organisms namely Lactobacillus sp., Bifidobacterial sp., Lactococcus sp. and Pediococcus sp. which have the ability to colonize, exert impact on immune system and have adverse effect on the intestinal pathogenic micro organisms.

Numerous combinations can be obtained by choosing 1 from column1 + 1 from column 2 and 1 from column 3, and mixed with pinch of salt and sugar (preference) and serve.

**Table 1.** Sample preparation chart

S.No	Column 1 (Probiotics Like) Curd + Spices-(Powdered)	Column 2 (Prebiotics)-Tubers(Crushed)+ Cereals & Pulses-(Germinated & Powdered)	Column 3 (Protective Foods-Antioxidants) Fruits & Vegetables-(Shredded)
1	ICurd+Cumin Seeds	A-Onion	A-Cabbage
2	IICurd+Cinnamon	B-Garlic	B-Carrot
3	IIICurd+Mustard	C-Ginger	C-Tomatoes
4	IVCurd+Fenugreek	D- Green peas	D- Curry Leaves
5	VCurd+Corriander	E- Chickpeas	E Banana
6	VICurd+Pepper	F- Soyabeans	F-Grapes
7	VII Curd+Redchilly	G - Wheat	G- Pomegranate
8	VIII Curd+Cloves	H - Bajra	H- Basil Leaves
9	IX Curd+Cardamom	I- Ragi	I-Hisbiscus Flowers

Numerous combinations can be obtained by choosing 1 from column1 + 1 from column 2 and 1 from column 3, and mixed with pinch of salt and sugar (preference) and serve.

## 2.7 Assessment of Nutritional Status of the Selected Pregnant Women

The nutritional status of pregnant women was assessed with the help of maternity health workers in the hospital through clinical, biochemical and Immunological parameters (Albumin, Total protein, globulin, lipid profile, calcium, SGOT, SGPT and hematological parameters hemoglobin, neutrophils, eosinophils, lymphocytes and monocytes and Hemoglobin).

## 3. Results and Discussion

### 3.1 Occurrence of Infections among Expectant Mothers

From the above results it is evident that before the counseling process the 30% of the subjects suffered from diarrhoea, and cold and 30% showed the absence of general infections (Table 2). None of the subjects took medications as per the physician's advice and managed with the infection for two or three days. It is clearly observed, after the counseling sessions the rate of diarrhea and cold has been reduced to 10% and from common infections (Skin, Dental, UTI and Vaginal) was reduced among the 70% of the subjects. The subjects suffering from fever and hepatitis did not show difference before and after counseling.

**Table 2.** Occurrence of infection among expectant mothers(%) (n = 250)

Infections	Before Counseling	After Counseling
Fever	05%	05%
Diarrhoea	30%	10%
Hepatitis	05%	05%
Cold	30%	10%
Did not suffer from common infections (Skin, Dental, UTI & Vaginal )	30%	70%

(All the selected subjects underwent health check up once in a month regularly in the Clinic)

### 3.2 Clinical and Hematological Assessment

It is evident from the results counseling and supplementation reduced the incidence of high normal blood pressure in 10 percent of the subjects (Table 3). Lipstein et al.,<sup>1</sup> quoted that the development

of hypertension during pregnancy is a serious and potentially fatal condition and is a leading cause of maternal morbidity.

**Table 3.** Assessment of blood pressure (systolic/diastolic mmhg) among expectant mothers(%) (n=250)

Category' mm/Hg	Before Counseling	After Counseling
Optimal (110/70)	15	15
Normal (120/80)	70	80
High Normal(130/90)	15	05

\*Source (WHO 2003)<sup>14</sup>

Table 4 shows that the counseling sessions and the supplementation of the probiotic diet among the subjects have reduced the gastro intestinal disturbances like nausea, vomiting and anorexia, allergies and general weakness. It is concluded that diet counseling and probiotics diet is effective in improving the overall health status of the pregnant women.

**Table 4.** Assessment of general health and clinical symptoms among expectant mothers (n-250)

Symptoms	Before Counseling %	After Counseling %
Nausea	60	20
Giddiness	40	30
Bleeding	05	05
Vomiting	65	40
Disturbed vision	--	--
Head ache	05	05
Odema	35	15
Bulimia	10	10
Anorexia	40	10
Weight loss	--	--
Weight gain	90	90
Allergies	45	15
Dysentery	45	15
Sore throat	20	05
Insomnia	46	10
General weaknes	45	20
GI tract ulcers	40	10

#### 3.2.1 Hemoglobin Levels of Selected Subjects

It is evident from Table 5 that before counseling and probiotic dietary supplementation majority of the subjects (80%) were anemic (severe (30%), moderate (15%) and mild (35%). General infections and malnutrition may

lead to iron deficiency in mothers and gives a greater risk of developing anemia. During pregnancy, an increased plasma volume with the lack of an adequate increase in erythrocytes mass results in a decrease in hemoglobin level and the development of anemia, which is defined as dilution anemia. In addition the general decrease in different blood indices is more likely to be explained by increased needs during pregnancy. After counseling and probiotic dietary supplementation the percentage of anemic status has been reduced to 20% for severe, 10% for moderate, 30% for mild and 40% subjects showed the normal hemoglobin. Therefore, the increase in these blood indices is a reflection of adequate iron supply resulting in increased hemoglobin production. The results clearly indicate the beneficial outcome of the diet and health counseling regarding general and nutritious food intake and the usefulness of the probiotic curd recipe supplementation and popularization among the pregnant women.

**Table 5.** Assessment of hemoglobin among expectant mothers (%) (n=250)

Haemoglobin g/dl	Before Counseling	After Counseling
Normal>12	12.1(20%)	12.8 (40%)
Mild>10-12	11.3(35%)	11.9(30%)
Moderate 7-10	8.4(15%)	9.0(10%)
Severe	6.50(30%)	6.6(20%)

Source: WHO (2003) Figures in parenthesis indicate the percentage of the subjects<sup>13</sup>.

### 3.2.2 Hematological Parameters of Expectant Mothers

Neutrophils showed marked level of benefits which indicate the significant changes in the improvement of immune system. Decrease in the count of eosinophils showed that the allergic reactions could be initiated by the release of histamines tremendously in both the groups. Lymphocytes level also found to be beneficial in the reduction of the general health complications and immune system related deficiencies. Lymphocytes progressively are increased whereas eosinophil count was decreased in both the groups (Table 6). Such finding are in concurrent with that obtained by James et al.,<sup>2</sup> and

Osonuga et al.<sup>3</sup>. Leukocytosis occurring during pregnancy may be due to the physiologic stress induced by the pregnant state.

**Table 6.** Assessment of hematological parameters among expectant mothers (%) (n=250)

Parameters (x10 <sup>3</sup> /mm <sup>3</sup> )	Before Counseling	After Counseling
Neutrophil (%)	51.90 ± 13.80(20%)	60.90 ± 03.80*(40%)
Eosinophil (%)	10.33 ± 4.27*(65%)	05.33 ± 1.27*(65%)
Monocyte (%)	1.00 ± 0.00(95%)	1.00 ± 0.00(80%)
Basophil (%)	1.42 ± 0.81*(75%)	1.42 ± 0.81*(75%)
Lymphocyte (%)	35.68± 14.62*(25%)	36.68± 14.62*(20%)

\* Statistically significant at 5% probability level

### 3.3 Biochemical and Immunological Status of Expectant Mothers

From the Table 7 it is observed that there is no difference in serum total protein, albumin and globulin levels before and after the counseling process accompanied by the probiotics dietary supplementation.

**Table 7.** Assessment of biochemical and immunological parameters among expectant mothers (%) (n=260)

Parameters	Biochemical Parameters	
	Before Counseling	After Counseling
Total Protein g/dl	5.58±0.13(35%)	5.60±0.13(45%)
Albumin g/dl	3.28±0.09(20%)	3.29±0.01(20%)
Globulin g/dl	2.29±0.35(10%)	2.29±0.35(10%)
Cholesterol (<200) mg/dl	>201(40%)	>201(30%)
Triglycerides (<150) mg/dl	>151(40%)	>151(30%)
HDL (40-60)mg/dl	<40(75%)	<40(45%)
LDL (<150)mg/dl	>151(70%)	>151(25%)
SGOT (5-43IU/L)	>45(25%)	>45(25%)
SGPT (7-56IU/L)	>60(35%)	>60(30%)
Calcium (8.7-10.2)mg/dl	<8.69(65%)	<8.69(60%)

Source: WHO (2003)<sup>13</sup>

The results showed significant difference at 5% level for cholesterol, LDL and triglycerides, which indicates that supplementation was beneficial to the subjects (Table 7).

Increased level of HDL after the supplementation phase indicated the significance of the effort. Measurement of serum SGOT and SGPT activities is the most useful test for the routine diagnosis of heart and liver diseases. In the majority of published studies, SGOT and SGPT activity levels do not change during pregnancy or remain within the normal limits established in non pregnant women (Bacq<sup>4</sup>; Jamjute et al.,<sup>5</sup> and Joshi et al<sup>6</sup>). On the other hand, the observed elevation of SGPT activity in the third trimester in the present investigation in agreement with that reported by Loganathan et al.<sup>7</sup>; Jamjute et al.,<sup>5</sup> and Joshi et al.<sup>6</sup>. The raise in SGOT and SGPT is mainly attributed to the added placental secretion or due to increase in the production of the bone isoenzymes (Bacq<sup>4</sup> and Joshi et al<sup>7</sup>).

From the beginning of the third trimester, fetal growth slowly peaks leading to a corresponding decrease in plasma concentration of maternal and fetal hormonal factors that stimulate and regulate glucose mobilization (Green and Stephen<sup>8</sup>). The results showed significant change in the activities of SGOT and SGPT enzymes among the lactating mothers. Similar results were obtained by Iqbal et al.,<sup>9</sup> and Williams and Davison<sup>10</sup>. Calcium levels were low and there is a need to take care of its improvement. Similar results were supported by Ritchie and King<sup>11</sup> and Hanna<sup>12</sup>. Decrease of serum calcium during pregnancy and lactation may be due to fetal demand of maternal calcium for bone mineralization. Expectant mothers need to store about 30-50 gm of calcium during the course of pregnancy, of which 25 gm are needed by the fetus. Eighty percent of the total fetal calcium is deposited during the third trimester. The transport of ionized calcium from the mother to the fetus increases from about 50 mg/day at 20 weeks of gestation to a maximum of about 350 mg/day at 35 weeks of gestation (Indumati et al<sup>13</sup>). Elevated activities of SGOT and SGPT showed the cardiac and liver functions which indicate the health concern of the particular systems.

The low calcium levels, followed by the deviated SGOT and SGPT levels alarm the female community in Erode district on bone, heart and liver health.

## 4. Conclusion

The occurrence rate of common infectious conditions such as fever, diarrhoea, cold has been reduced. Gastro intestinal related disturbances like vomiting,

nausea, bulimia, anorexia, ulcers showed significant improvements. Allergic conditions were observed in the eliminated levels. No marked change was observed in the systolic and diastolic pressure. Increase in hemoglobin levels at the end of the project shows the impact of the diet counseling along with that of the probiotics dietary supplementation potential among the subjects. Favorable levels of neutrophils, decrease in eosinophils clearly supports the development of overall immune system. Total protein, albumin and globulin showed beneficial level for the efficient binding and transport mechanisms inside the body systems. Cholesterol, triglyceride, LDL, HDL showed no significant difference. Significantly elevated levels of SGOT and SGPT enzymes were observed among pregnant women. Reduction in calcium deficiency was observed among the pregnant women at the end of the study.

From the study it is concluded avoidance of junk foods and regular intake of pre and probiotic home made curd based recipe among expectant mothers were found to have beneficial effect on the overall physical, mental and better reproductive health of Indian female. Supplementation of the probiotics can also be recommended and popularized among all the age groups of the community.

## 5. References

1. Lipstein HB. A current concept of eclampsia. *American Journal of Emergency Medicine*. 2010; 2(13):223-6.
2. James TR, Reid HL, Mullings AM. Are published standards for haematological indices in pregnancy applicable across populations: An evaluation in healthy pregnant Jamaican women. *Biological Medical Central Pregnancy and Child-birth*. 2008.
3. Osonuga IO, Osonuga OA, Onadeko AA, Osonuga AA. Hematological profile of pregnant women in southwest of Nigeria. *Asian Pacific Journal of Tropical Disease*. 2011; 232-4.
4. Bacq Y. The liver in normal pregnancy. *Madame curle bio-science database, NCBI bookshelf ID:NBK 6005,2000*.
5. Jamjute P, Hmad A, Ghosh T, Banfield P. Liver function test and pregnancy. *Journal of Maternal-Fetal and Neonatal Medicine*. 2009 Mar; 22(3):274-83.
6. Joshi D, James A, Quaglia A, Westbrook RH, Heneghan MA. Liver disease in pregnancy. *Durham, NC, USA: Duke University Medical Centre*; 2010 Feb. p. 594-605.
7. Loganathan G, George R, Eapen CE, Mathai M, Jasper P, Seshadri L, Shankar V, Paul S, Joseph G, Balasubramanian KA, Chandy GM. Liver function tests in normal pregnancy a study from Southern India. *Indian Journal of Gastroenterology*. 2005; 24.

8. Green D, Stephen M. Fetal maternal metabolism relationship. *Journal Obstetricians and Gynecologists*. 2002; 33:11–8.
9. Iqbal SA, Akhtar MS, Ansari AK. Assessment of renal function during various stages of pregnancy in women. *proc. Pakistan Academic Science*. 2003; 40(20):165–71.
10. Williams D, Davison J. Chronic kidney disease in pregnancy. *British Medical Journal*. 2008; 336:211–5.
11. Ritchie LD, King JC. Dietary calcium and pregnancy-induced hypertension: Is there a relation? *The American Journal of Clinical Nutrition*. 2000; 71(suppl):1371S–4S.
12. Hanna B. The role of calcium correction during normal pregnancy at 35. Third Trimester in Mosul Oman Medical Journal. 2009; 24(3):188–94.
13. Indumati V, Kodliwadmath MV, Sheela MK. The role of serum electrolyte in pregnancy induced hypertension. *Journal of Clinical and Diagnostic Research*. 2009; 5(1):66–9.
14. WHO. The prenatal and immediate postnatal periods. *Bulletin OMS Supplementary*. 2003; 67:9–18.