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RESULTS AND DISCUSSION

The outcome of the study on **"Effect of Intervention on Nutritional and Reproductive Health Status and Life Style Pattern of the Selected Tribal Girls (10-15yrs)"** are presented and deliberated under the following headings.

A: Demographic and socio economic profile of the families of tribal and nontribal girls (10-15yrs)

B: Assessment of nutritional status of the selected tribal and non-tribal girls (10-15yrs).

C: Evaluation of nutritional and reproductive health awareness among the selected girls

D: Selection of tribal girls for intervention

E: Raising nutrition garden at home level and collection of data related to wild edible flora and analysis of the nutrient and phytochemical content

F: Effect of nutrition interventions on dietary and life style pattern, nutrition and health status of the selected tribal girls

G: Assessment of nutritional Knowledge, Attitude, and Practices on nutrition, personal and menstrual hygiene among the selected tribal girls.

A: Demographic and socio economic profile of the families of tribal and nontribal girls (10-15yrs)

a. Contour of the Selected Area and Tribal and Non-Tribal Girls

Both Kannur and Wayanad districts were selected for the present study to distinguish the variations of the socioeconomic and dietary pattern and health status the primitive (Wayanad) and migrant (Kannur) tribal girls (10-15yrs).

Based on the willingness of the selected tribal girls and responds to the interview schedule, 150 tribal and 150 nontribal tribal girls from Aralam and the same number of 150 tribal and 150 nontribal girls from Pulpally area were selected for the study. Nontribal girls

were selected from the area to find out the difference among the tribal and nontribal tribal girls in terms of socio economic, dietary and life style pattern nutritional and menstrual health status. The tribal girls were selected from the government schools near to the selected study area.

Table 8: Age wise distribution of the selected girls

Particulars	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Age (years)								
10-12	62	41	53	35	67	44	59	39
13-15	88	59	97	65	83	56	91	61
Total	150	100	150	100	150	100	150	100
Menstruation attained at the age of								
10-12 years+	36	24	19	13	31	21	16	11
13-15 years	85	57	91	61	78	52	88	59
Total	121	81	100	73	109	73	104	70
Not yet attained menstruation								
10-12 years+	26	18	34	23	36	24	43	29
13-15 years	3	2	6	4	5	3	3	2
Total	29	19	40	27	41	27	46	31

NT- Non-Tribal girls, T-Tribal girls

Table 8 highlighted that, 59 and 56 percent of the non-tribal tribal girls and 65 and 61 percent of the tribal girls in the age group of 13-15 years in Aralam and Pulpally area respectively and 41 and 44 percent of the non-tribal tribal girls and 35 and 39 percent of tribal girls were in the age group of 10-12 years. 57 and 52 percent of the non-tribal tribal girls 61 and 59 percent of the tribal girls in the 13-15 years age group and 24 and 21 percent of the non-tribal and 13 and 11 percent of the tribal girls were attained their menarche in the age group of 10-12 years. Non-tribal tribal girls were attained their menarche earlier than the same age group tribal girls from the tribal area.

b. Demographic profile

Socioeconomic status of the selected tribal and nontribal girls (10 and 15 years) were discussed in the following aspects, Area and type of the house, type of home, number of members in the family of the selected tribal girls, educational and occupational profile and family income and expenditure pattern of the parents of the selected tribal girls were

The road to the tribal residential area

Water sources in the tribal area (Other than Well and Pipe)

Plate 6

collected. Apart from these status, the infra structure available for the tribals like network of the roads, water and electricity, drainage facilities, hospitals and school facilities were observed and recorded by the investigator during the study period, visited to those two tribal areas. In addition to these observation, the investigator created a rapport with the Tribal Development Officers, Tribal Promotors, and Tribal Elders for effective collection of data.

1. **Condition of the study area**

The area selected for the present study was 'Aralam' Panchayat of Kannur and Pulpally Panchayat of Wayanad District of Kerala State. Nearly 90 percent of the tribals in the Aralam were resettled by the government. In 1970, the Government of India established the Aram Farm. Sixty percent of the tribals in this area worked in this farm for their economic needs. In this area, tribal families started living individually under the Government Cooperation without have a particular leader like the other tribal community. Even though the public transport was limited, the roads were good and clean in condition. Pulpally was the most isolated area in Kerala with rich agricultural income. This area was in the midst of a thick forest with dense tribal population and tribals had a clustered life. There were 89 tribal colonies present in this area. Their houses were separated with or without shrub fence or wooden trunk fence. These tribes did not had any interaction with the nontribal counterparts. These 'primitive' tribals lived in dense forests and were forest wanders for their livelihood. The public transport facility was very rare or not available through many of these settlement and the road was not maintained well because the road tarring through the forest was very restricted for the sake of wild animals. Many of the non-tribal tribal girls were in the nearer town area and they had good transport facility when compared to the tribal girls. The photos (Plate 6) showed the road to the tribal residential area.

2. **Water and Electricity facilities**

Both the Aralam and Pulpally areas were blessed with enough water sources like ponds, streams, and rivers. Table 9 and 10 indicated the water and electricity available in the study areas.

Table 9: Water resources

Sources*	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Own well	68	45	19	13	72	48	3	2
Public well	-	-	26	17	3	2	31	21
Bore-well	59	39	72	48	31	21	16	11
Pipe water	18	12	19	13	-	-	132	88
River	49	33	52	35	58	39	120	80
Streams	34	23	37	25	42	28	69	46

*multiple responses, NT- Non-Tribal girls, T-Tribal girls

Forty five percent of non-tribal girls from Aralam and 48 percent from Pulpally had own well to meet their needs especially for drinking purpose. Forty eight percent of Aralam tribal girls used bore-well for their water needs and 88 percent of the Pulpally tribal girls depended pipe water for their water needs. Around 50 to 80 percent of the families of the selected girls from tribal and nontribal area entrusted in river water for washing and bathing (Plate 6). Tribal settlements benefited some of the rain water projects to preserve the rain water but most of them were not activated properly.

Table 10: Availability of electricity

Availability	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	Tribe (n=150)	%	NT (n=150)	%	T (n=150)	%
Available	150	100	123	82	139	93	102	68
Not Available	-	-	27	18	11	7	48	32
Total	150	100	150	100	150	100	150	100

NT- Non-Tribal girls, T-Tribal girls

It is very perceptible that cent percent of the families of the non-tribal subject from Aralam and 93 percent of the families of the non-tribal tribal girls from Pulpally had the electricity facility whereas 82 percent of the families of the tribal subject from Aralam and 68 percent of the tribal families from Pulpally had the availability of electricity.

3. Discriminations and uniqueness of the selected tribal families

According to Thomas (2014), a human dwelling not only has its built form, but also the surrounding area, and each inhabitant travels for daily routine. In the case of tribal

ecosystems, this area is limited to surrounding fields and forests, since walking is the foremost mode of conveyance. These indigenous tribal communities upheld the time-tested Lactation: The tribal mothers were not aware of the health benefits of colostrum and did not feed the colostrum to their new born babies and considered it as impure milk and not good for the health of new born baby.

  - Funeral: They buried the dead bodies in the river bank. For this purpose, they dug a deep pit (in slanting position) in the river bank. The dead person's favorite things were buried with the dead body in that pit. Tribals believed that this type of activities fulfilled their desires and made them happy.
  - Addictions: Most of the tribal women and men were addicted to alcohol and betel chewing. Traditionally, they had their own way of preparing alcohol. Many of the tribals were well worked in this preparation and used whole grains and cashew apples for this alcoholic preparation. Betel chewing (Pokala Murukan) was one of their favorite habits. They were made with tender betel leaves, areca nut, lime and dried tobacco (Pokala) and very few people were out of this habit. The painful truth was that most of young children are addicted to this type of practices. Both children and their parents were unaware of the consequences of alcohol addictions.

- Lack of knowledge regarding the modern equipment and technology
- Clustered life is enjoyable
- Each tribes had their own traditional arts
- Follow the traditional food pattern
- They don’t trust the outer world
- They lead life by knowing the rhythm of the forest
- They protect and save wild resources for future generation
- Well known about the medicinal value of each of the herbs
- Believed and expertized in the traditional naturopathic and Ayurveda medicines

Tribal Dressing, Ornaments, Tattoo

Plate 7

c. Socio Economic Status

Socio-economic status of the tribal population is not possible to measure directly and needed to tabulate the income and expenditure, house type, family type, nature of the tenure of the house, distribution of owned land, possessions, and measure the affordability and accessibility to the amenities for this purpose.

1. Socio-economic profile

Table 11 highlights the socioeconomic profile of the families of the selected tribal girls.

Table 11: Socio economic profile

Particulars	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
• **Family Income* (Rs)**								
Lower income (<3300)	9	6	123	82	4	3	132	88
Lower middle income (Rs.3301-7300)	45	30	27	18	33	22	18	12
Middle income (7301-14500)	73	49	-	-	62	41	-	-
High income (>14500)	23	15	-	-	51	34	-	-
• **Family Type**								
Nuclear	107	71	95	63	99	66	80	53
Joint	43	29	55	37	51	34	70	47
• **Number of members in the families**								
≤3	29	19	-	-	18	12	-	-
4-7	119	79	144	96	121	81	33	22
8-10	2	1	6	4	11	7	98	65
>11	-	-	-	-	-	-	19	13

*HUDCO (2007) - Housing And Urban Development Corporation, NT- Non-Tribal girls, T-Tribal girls (150 in each group)

From the above table it was clear that, 82-88 percent of tribal girls were belonged to low income family. Nearly fifty percent of the non-tribe tribal girls were from middle income group. Joint family system was preferred by tribals when compared to the non-tribal counterparts. None of the tribal family had less than three members whereas none of the non-tribe family contains more than 11 members in their family. Sixty five percent of the tribal girls from Pulpally Panchayat came from family holds 8-10 members. Following the integrated family system, many tribals from Wayanad District lived together and generously

shared their possessing. Government gathered tribal communities from various parts of Kerala as the part of Tribal Welfare and Forest Conservation Board in Aralam. All the tribal girls from this area were belonged to the migrant communities and they tried to follow the routine daily activities of the non-tribe counterpart.

2. **Monthly expenditure pattern**

Economic profile highlights their income and expenditure pattern. Nontribal tribal girls spent more amount of money for education and food needs whereas very good amount of the tribal income was spent on alcohol and tobacco. Tribes did not have the habit of saving money. They earned money from hired jobs or other agricultural jobs, and they spent most of their income on card playing or other activities and meagre amount to fulfill their basic requirements of food, clothing and so on.

Table 12: Monthly expenditure pattern

Money expenditure (Rs)	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Food								
>2351	30	20	-	-	28	19	-	-
1851-2350	53	35	-	-	36	24	-	-
1351-1850	67	45	-	-	51	34	-	-
851-1350	16	11	7	5	29	19	9	6
351-850	8	5	46	31	6	4	17	11
<350	-	-	97	65	-	-	124	83
Agriculture								
>2351	6	4	-	-	4	3	-	-
1851-2350	8	5	-	-	7	5	-	-
1351-1850	12	8	-	-	11	7	-	-
851-1350	25	17	-	-	19	13	-	-
351-850	23	15	21	14	46	31	21	14
<350	69	46	56	37	63	42	84	56
Spent nothing	7	5	73	49	-	-	45	30
Health/ medicine								
>2351	7	5	-	-	6	4	-	-
1851-2350	12	8	-	-	11	7	-	-
1351-1850	11	7	-	-	10		-	-
851-1350	12	8	-	-	18	12	-	-
351-850	41	27	-	-	49	33	-	-

<350	67	45	138	92	56	37	127	85
Spent nothing	-	-	12	8	-	-	23	15
Dress								
>2351	2	1	-	-	-	-	-	-
1851-2350	9	6	-	-	3	2	-	-
1351-1850	18	12	-	-	9	6	-	-
851-1350	47	31	-	-	42	28	-	-
351-850	56	37	9	6	67	45	7	5
<350	18	12	92	61	29	19	86	57
Spent nothing	-	-	51	34	-	-	55	37
Education								
>2351	65	43	-	-	54	36	-	-
1851-2350	38	25	-	-	43	29	-	-
1351-1850	41	27	-	-	17	11	-	-
851-1350	6	4	-	-	23	15	-	-
351-850	-	-	-	-	10	7	-	-
<350	-	-	21	14	3	2	8	5
Spent nothing	-	-	129	86	-	-	142	95
Entertainment								
>2351	-	-	-	-	-	-	-	-
1851-2350	3	2	-	-	3	2	-	-
1351-1850	2	1	-	-	4	3	-	-
851-1350	23	15	-	-	17	11	-	-
351-850	60	40	22	15	29	19	8	5
<350	57	38	128	85	83	55	131	87
Spent nothing	5	3	-	-	14	9	11	7
For Menstrual absorbent								
>100	5	3	-	-	3	2	-	-
51-100	41	27	-	-	36	24	-	-
<50	81	54	22	20	93	62	-	-
Spent nothing	23	15	88	80	18	12	104	100
Sanitizer (Body soap, Detergents, etc.)								
>100	76	51	-	-	44	29	-	-
51-100	58	39	8	5	83	55	-	-
<50	16	11	142	95	23	15	150	100

NT- Non-Tribal girls, T-Tribal girls

Data revealed that 43 and 36 percent of the nontribal families from Aralam and Pulpally areas respectively spent more than ₹. 2351 for education and food. At the same time, none of the families of the tribal girls spent appreciable amount of their income for this purpose.

Sixty five and 83 percent of the tribal families spent less than ₹. 350 on their food, 92 and 85 percent of tribal spent the same on their health and medicinal need respectively. Eight and 15 percent of them did not spend any for this purpose. It was observed that none of the tribal families from Pulpally had spent any amount of money to purchase menstrual absorbents. Cent percent of them spent less than ₹. 50 for sanitizers.

d. House Status

Data collected revealed that the tribal people in the ancient period possessed thatched houses with a roof made of straw and leaves of palm and coconut trees with one small entrance. The side walls of their houses were made of bamboo and palm trees with mud package. In the current scenario, the selected families of the nontribal tribal girls in the study area had proper ceiling with basic facilities. Inside their houses, there was partition wall to separate their kitchen and other rooms and enough space for storage of their cooking vessels and provisions, in the kitchen. They had rooms with attached toilet. Among the tribal families surveyed in the study area of Aralam and Pulpally, majority of the selected tribal families (82 percent) availed Government allotted houses and toilets. The house roofed with clay tiles/concrete/asbestos sheet and brick wall with one entrance door in front and one exit door in back. These houses had one entrance area one bed room and one kitchen.

Table 13: Status of the house

Particulars	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
House type								
Pucha (Concrete/Tiled/ Well constructed)	112	75	-	-	98	65	-	-
Semi pucha (Clay tile, Tin/Asbestos sheet/ moderately constructed)	38	25	23	15	52	35	17	11
Kutcha (clay tile/palm or coconut leaves/ poor construction)	-	-	119	79	-	-	112	75
Unserviceable Kutcha	-	-	8	5	-	-	21	14
Area of house (sq. feet)								
100-300	-	-	26	17	-	-	58	39
301-500	-	-	112	75	4	3	92	61
501-700	29	19	12	8	27	18	-	-
701-1000	97	65	-	-	84	56	-	-
>1000	24	16	-	-	35	23	-	-
Nature of tenure of the house								

Own	142	95	-	-	139	93	-	-
Rented	8	5	-	-	11	7	-	-
Government provided	-	-	39	26	-	-	24	16
Partly by government	-	-	103	69	-	-	105	70
No proper home	-	-	8	5	-	-	21	14
Owned agricultural land								
>3 Acre	24	16	-	-	64	43	-	-
1-2 acre	68	45	-	-	32	21	-	-
50c-1 acre	32	21	105	70	24	16	3	5
10-50 c	19	13	45	30	30	20	119	79
Up to 10 c	7	5	-	-	-	-	16	11
No land	-	-	-	-	-	-	12	8

NT- Non-Tribal girls, T-Tribal girls

Most of the non-tribal families (75 and 65 percent in Aralam and Pulpally respectively) had good and secure house whereas 14 percent families from Pulpally and five percent tribal families from Aralam didn't have a proper house. They made huts with palm trees or plastic sheets, which was temporary, and sought protection from different climate conditions and from wild animal attack. Nearly 79 percent of the tribal families had kutcha type house with or without minimum facilities for their living (Plate 8).

The study also revealed that none of the tribal families of the selected tribal girls had a house with more than 700sqft of the total area whereas most of the non-tribal families had a house with more than 700sqft area. Eight percent of the tribal families from Aralam Panchayat had a house with total area of 501- 700sqft. Majority (75 and 61 percent) of the tribal families is Aralam and Pulpally had a house with the total area of 301- 500sqft.

Table illustrated that the nontribal families had owned or rented house for their residence. Fourteen and nearly six percent of the tribal families from Pulpally and Aralam didn't have a proper house. Depending on monetary ability, the government provided financial assistance partially or fully to the tribal family for housing purpose.

Nearly 60 percent of population in Kannur and Wayanad Districts are self-employed or agricultural labors in their own land. Wayanad was formerly known as 'Wayalnadu', it means 'land of paddy'. As the name indicated, around 80 percent of the people in this District were agricultural laborers and 90 percent of the nontribal population have their own land. Tribals like 'Paniya' and 'Adiya' as the name indicated, field laborers. Paddy, Tea, Coffee, Cardamom, and Pepper were the major cultivations in Wayanad District and Rubber,

Types of houses among tribals

Plate 8

Coconut, areca nut, cashew nut, and pepper were the major crops in Kannur District. This study indicated that 95 percent of the nontribal families had minimum of 50cent land as their own. Tribals from Aralam were migrated community and government provided one acre land per each family at the time of their rehabilitation. The tribal families from Pulpally was provided with 40cent per family, but eight percent of the selected families still didn't have any land for their ownership.

e. Educational and occupational status of the parents of the selected tribal girls

Education is universally identified as a powerful instrument of social changes. The level of literacy is also considered as the important indicator for the social and economic upliftment. The study data revealed that their elders in the families were illiterate irrespective of the sex and at present status, parents of the selected nontribal tribal girls had their education up to graduation and none of them were illiterates, whereas in tribal area, the trend was noted in opposite manner that around 30 percent of them were illiterate and not preferred to have education.

1. Education Status

Literacy rate plays a major role in the socioeconomic status of the people in the country. There is an improvement in the rate of literacy among the male and category over the years. The results of the study area also shown an improvement in literacy rate and are expressed in Table 14.

Table 14. Education status of the parents of the selected girls

Educational level	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Mothers educational level								
Illiterate	-	-	35	23	-	-	43	29
Up to 5th	-	-	89	59	3	2	91	61
Up to 10th	45	30	18	12	57	38	12	8
Up to +2	58	39	8	5	65	43	4	3
Graduate and others	47	31	-	-	25	17	-	-
Fathers educational level								

Illiterate	-	-	51	34	-	-	44	29
Up to 5th	7	5	87	58	-	-	98	65
Up to 10th	79	53	12	8	87	58	8	5
Up to +2	48	32	-	-	34	23	-	-
Graduate and others	16	11	-	-	29	19	-	-

NT- Non-Tribal girls, T-Tribal girls

Table 14, clearly indicated that, both parents of the non-tribal girls were educated at least high school level whereas most of the parents of tribal girls were illiterate or had education up to basic primary school level. The tribal communities were engaged with agricultural works. From the childhood onwards parents of the selected tribal girls were forcefully directed in to the agricultural labors to meet their daily basic economic needs.

2. Occupational status

Occupation is a basic requirement of life. Human survival depends on the nature of his/her occupation. For the nontribal population, occupation for the fulfillment of certain responsibilities, and status symbol with the necessities of life. But for the tribal population, their occupation is for the sustainability of themselves and their family members. Parents of the nontribal girls worked in Government and other private sector and self-employed whereas parents of tribal girls were coolies and field laborers with minimum wages.

Table 15: Occupational status of the parents of the girls

Occupational status	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Mother's Occupation								
Govt. employees	3	2	-	-	7	5	-	-
Private employees	24	16	12	8	27	18	4	3
Self-employment	21	14	19	13	26	17	-	-
Agriculture/animal-husbandry (own)	20	13	18	12	17	11	26	17
Coolie	11	7	39	26	8	5	89	59
Collection of forest goods	-	-	13	9	-	-	9	6
Traditional works	-	-	-	-	-	-	5	3
Forest related jobs	5	3	7	5	7	5	2	1
Estate labour	12	8	34	23	9	6	15	10

Not Working/ house wife	32	21	8	5	49	33	-	-
Father's Occupation								
Gov. Service employees	7	5	2	1	3	2	-	-
Employees in private sector	25	17	18	12	12	8	3	2
Self-employment	28	19	4	3	38	25	8	5
Agriculture (own)	37	25	6	4	42	28	35	23
Coolie	18	12	43	29	14	9	31	21
Collection of forest goods	-	-	5	3	-	-	38	25
Traditional works	-	-	-	-	-	-	16	11
Forest related jobs	8	5	5	3	14	9	7	5
Estate labour	18	12	67	45	21	14	12	8
Not Working	9	6	-	-	6	4	-	-

NT- Non-Tribal girls, T-Tribal girls

From this study, it was exposed that 59 and 25 percent of the mothers and 25 and 21 percent of the fathers of the tribal girls from Pulpally were agricultural labors and coolies. Twenty six percent and 12 percent of the mothers and 29 and four percent of the fathers of the tribal girls from Aralam were agricultural laborers. Twenty two and 33 percent of mothers of the non-tribal girls were not engaged with any job outside the home and they were home makers. Six and four percent of fathers of the nontribal girls did not go for any work due to some health issues. Nearly twenty three and 10 percent of mothers and 45 and eight percent of the fathers of the tribal girls from Aralam and Pulpally had jobs in forest or forest related institute or in estate.

f. Availability of infrastructural facilities

Table 16 pointed out the infrastructural availabilities in the study area with reference to distance between the house and other amenities.

Table 16: Distance to access the amenities

Facilities Available	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Government Hospital								
100- 500 m	5	3	-	-	6	4	-	-
501-1000 m	48	32	-	-	39	26	-	-
1000 m- 2000 m	57	38	-	-	47	31	-	-
>2000 m	40	27	150	100	58	39	150	100

PHC								
100- 500 m	6	4	38	25	11	7	7	5
501-1000 m	35	23	71	47	52	33	16	11
1000 m- 2000 m	31	21	23	15	36	24	59	39
>2000 m	78	52	18	12	51	34	68	45
School								
100- 500 m	20	13	-	-	17	11	-	-
501-1000 m	68	45	23	15	89	59	18	12
1000 m- 2000 m	30	20	38	25	17	11	20	13
>2000 m	32	21	89	59	27	18	112	75
Anganwadi								
100- 500 m	11	7	28	19	9	6	16	11
501-1000 m	42	28	45	30	46	31	38	25
1000 m- 2000 m	67	45	68	45	76	51	85	57
>2000 m	30	20	9	6	19	13	11	7
Market								
100- 500 m	38	25	-	-	45	30	-	-
501-1000 m	98	65	-	-	86	57	-	-
1000 m- 2000 m	14	9	35	22	19	13	32	21
>2000 m	-	-	115	78	-	-	118	79
Post office								
100- 500 m	19	13	-	-	14	9	-	-
501-1000 m	95	63	18	12	76	51	9	6
1000 m- 2000 m	36	24	45	30	29	19	15	10
>2000 m	-	-	87	58	31	21	126	84
Panchayat office								
100- 500 m	14	9	-	-	18	12	-	-
501-1000 m	67	45	-	-	77	51	5	3
1000 m- 2000 m	41	27	-	-	37	25	14	9
>2000 m	28	19	150	100	18	12	131	87
Bus stop								
100- 500 m	38	25	-	-	29	19	-	-
501-1000 m	97	65	-	-	75	50	9	6
1000 m- 2000 m	15	10	13	9	34	23	21	14
>2000 m	-	-	137	91	12	8	120	80

NT- Non-Tribal girls, T-Tribal girls

Table described about the distance of the residence of the selected girls from the amenities, which were essential for time of emergency. Even though the amenities were far away from their tribal area, the government established services like Public Health Centre (PHC) and Anganwadi near to the tribal communities. Some of the PHC were not worked properly. The tribes went to government hospitals in serious health issues. Anganwadi stands as a center for the distribution of food supplements and ICDS programs for the tribal young girls and other vulnerable group of tribal population. Around 70 percent of the nontribal girls had excellent transportation to and from their place of residence. They had their own vehicles, or afforded taxi to heir for their need. Tribals rarely used public or private transportation, and were preferred to walk.

B: Assessment of nutritional status of the selected tribal and nontribal girls (10-15yrs)

Nutritional assessment of young girls from a tribal community is essential to eradicate several health problems from the community. According to World Health Organization (WHO), improvement in the human health is the crucial goal of nutrition assessment. Lack of health facilities, limited education, unavailability of nutrient rich foods, unequal distribution of wealth and economic constraints adding oil to the fire for affecting the health status of young girls. Nutritional status can be scrutinized through anthropometric measurements, biochemical and physical estimation, clinical examinations and dietary intake (SriLakshmi, 2018)

a. Anthropometric measurements

Monitoring of growth through anthropometric dimensions for the duration of this teenage is a significant device of health and a predictor of various medical conditions. Although anthropometry is comprehensively appropriate, inexpensive and simple, it continuing as a useful device to assess the public and individual health needs (Sachan et al., 2012).

1. Height: Height is an indicator of proper growth among young children. Table 17 explained the mean height for age with standard deviation along with the maximum and minimum score. Collected data reveled that Pulpally tribal girls notched the poor score.

Table 17: Mean height (for age) of the selected girls

Height for age	Reference*	Aralam (N=300)		Pulpally (N=300)	
		NT Mean±SD (n=150)	T Mean±SD (n=150)	NT Mean±SD (n=150)	T Mean±SD (n=150)
10+Years	140 (cm)	136.4±6.35	135.38±5.82	135.45±5.52	128.83±5.92
Maximum-Minimum		146 -126	145 -124	144 -127	133 -113
Excess/Deficient		-3.6	-4.6	-4.5	-11.2
11+Years	145 (cm)	142.33±3.50	140.64±6.89	140.93±3.91	133.08±8.73
Maximum-Minimum		151 -135	146 -129	152 -132	140 -125
Excess/Deficient		-2.7	-4.4	-4.1	-11.9
12+Years	150 (cm)	149.06±9.45	146.67±7.93	149.92±3.57	143.11±8.58
Maximum-Minimum		166 -136	162 -132	160 -142	156 -132
Excess/Deficient		-0.9	-3.3	-0.1	-6.9
13+Years	154 (cm)	152±8.44	149.00±7.54	154.65±4.30	147.82±7.57
Maximum-Minimum		166 -139	165 -130	163 -140	159 -128
Excess/Deficient		-2.0	-5.0	+0.7	-6.2
14+Years	157 (cm)	155.64±6.98	153.94±6.93	157.82±3.80	151.53±8.69
Maximum-Minimum		170 -142	165-135	166 -150	162-127
Excess/Deficient		-1.4	-3.1	+0.8	-5.5
15+Years	159 (cm)	156.26±5.47	154.27±7.37	159.86±3.90	152.42±7.21
Maximum-Minimum		166 -145	160 -132	168 -151	162 -139
Excess/Deficient		-2.5	-4.7	+0.9	-6.6

*ICMR 2010, NT- Non-Tribal girls, T-Tribal girls

The table 17 described the height of the selected girls and were compared with the ICMR (2010) reference value. The data reveled that, the 10-11 years aged tribal girls from both nontribal and tribal girls from Aralam showed at least 3.5 percentile deficient to the standard mark, whereas the tribal subject from Pulpally deficient 11. 2 percentile to the standard scale.

Severe stunting could be observed in this group. Up to12+years nontribal tribal girls also showed little of deficient to the standers mark (-2.7 and -4.1 deficient for 11+years, -0.9 and -0.1 for 12+ years). From 13+years onwards the nontribal tribal girls from Pulpally attained the accurate positive scores (0.7, 0.8, 0.9 respectively to 13+, 14+ and 15+ years). Whereas nontribal from Aralam showed stunting slightly (-2,-1.4 and -2.5 respectively to 13+, 14+ and 15+ years). Both the tribal group showed significant level of deficient in their height when compared to the reference value. Tribal group of Aralam attained a deficit of -4.6, -4.4, -3.3, -5, -3.1 and -4.73 from 11+years to 15+years respectively and tribal subject from Pulpally deficient -11.2,-11.9, -6.9, -6.2, -5.47, and-6.58 respectively from 11+years to 15+years. Statistically analyzed data revealed that the tribal girls showed higher stunt rate than that of the nontribal girls.

2. Weight: Measuring the body weight is very important aspects to be conduct particularly in the nutritional assessment. The measurement could assess the muscular wasting of the selected tribal girls and highlighted in Table 18.

Table 18: Weight (for age) of the selected girls

Weight	Reference*	Aralam (n=300)		Pulpally (n=300)	
		NT Mean±SD (N=150)	T Mean±SD (N=150)	NT Mean±SD (N=150)	T Mean±SD (N=150)
10+Years	31 (Kg)	30.2±3.94	26.54±3.84	30.73±4.20	20.94±3.75
Maximum- Minimum		39- 24	35- 20	36- 25	27- 14
Excess/Deficient		-0.8	-4.5	-0.3	-10.0
11+Years	35 (Kg)	36.46±3.76	31.00±5.04	37.21±2.29	27.08±5.56
Maximum - Minimum		43 - 32	37- 22	41- 32	36- 20
Excess/Deficient		+1.5	-4.0	+2.2	-7.9
12+Years	39 (Kg)	41.47±11.74	35.4±5.49	42.23±4.69	34.56±6.19
Maximum - Minimum		57 - 24	44 - 22	46 - 30	42 - 28
Excess/Deficient		+2.5	-3.6	+3.2	-4.4
13+Years	43 (Kg)	44.40±8.49	36.90±5.90	45.42±4.29	34.51±6.24
Maximum - Minimum		62 - 30	49 - 21	53 - 37	48 - 20
Excess/Deficient		+1.4	-6.1	+2.4	-7.5
14+Years	47 (Kg)	49.29±11.68	39.38±4.66	50.02±8.67	37.82±7.02
Maximum - Minimum		75 - 35	48 - 31	65 - 33	55 - 25
Excess/Deficient		+2.3	-7.6	+3.0	-9.2

15+Years	49 (Kg)	45.22±80.01	40.52±6.26	52.26±6.40	38.81±5.83
Maximum - Minimum		61 - 35	53 - 30	68 - 39	57 - 30
Excess/Deficient		-3.8	-8.5	+3.3	-10.2

*ICMR 2010, NT- Non-Tribal girls, T-Tribal girls

Table 18 enlightened that 10+years Aralam nontribal girls had deficit their weight by 0.8 when compared to ICMR 2010 reference value, but the tribal girls in the age range of 11-14 years scored excess (1.5, 2.5, 1.4 and 2.3 respectively) when compared to the ICMR scores. 10+years of Pulpally nontribal girls also showed the deficit score by 0.3 and 11-15+years girls of the same group showed excess in their weight score (2.2, 3.2, 2.4, 3.0 and 3.3 respectively). Both of the tribal girls' scored deficit to the standard score in Aralam they scored -4.5, -4.0, -3.6, -6.1, -7.6, and -8.5 and Pulpally tribe tribal girls scored -10.1, -7.9, -4.4, -7.5, -9.2 and -10.2 respectively from10-15+years. Pulpally tribes showed the extreme deficit when compared with the other study groups.

3. Body Mass Index (BMI): Body Mass Index is a derived value from height and weight of an individual. According to different rage of the scores, it can be classified in to thinness, normal, over weight and obese and given in Table 19.

Table 19: Body Mass Index (BMI)

BMI for age	Reference	Aralam (N=300)		Pulpally (N=300)	
		NT Mean±SD (n=150)	T Mean±SD (n=150)	NT Mean±SD (n=150)	T Mean±SD (n=150)
10+Years	15.9	16.27±2.24	14.44±1.51	16.88±1.60	13.35±1.67
Maximum - Minimum		21.09 - 13.85	17.12 - 12.25	18.94 - 13.46	16.74 - 10.96
Excess/Deficient		+0.4	-1.5	+1.0	-2.6
11+Years	16.5	18.01±1.86	15.58±1.51	18.73±0.78	15.13±1.36
Maximum - Minimum		21.22 - 15.01	17.28 - 12.76	20.19 - 17.60	17.60 - 12.60
Excess/Deficient		+1.5	-0.9	+2.2	-1.4
12+Years	17.3	18.31±3.32	14.97±1.48	18.77±1.81	15.85±1.38
Maximum - Minimum		22.83 - 12.76	17.83 - 12.42	21.00 - 13.88	17.97 - 14.27
Excess/Deficient		+1.0	-2.3	+1.5	-1.5
13+Years	18.3	19.26±3.24	16.06±1.85	18.98±1.49	15.67±1.81
Maximum - Minimum		28.45 - 13.55	21.52 - 12.43	22.06 - 15.61	19.82 - 11.65
Excess/Deficient		+1.0	-2.2	+0.7	-2.6
14+Years	19.1	20.34±4.57	16.42±1.79	20.07±2.40	16.35±1.93
Maximum - Minimum		31.16 - 12.64	20.85 - 12.74	27.06 - 13.78	22.03 - 13.32

Excess/Deficient		+1.2	-2.7	-1.0	-2.8
15+Years	19.6	19.38±2.18	17.27±2.41	20.49±2.76	16.68±2.03
Maximum - Minimum		23.05 - 14.57	22.96 - 14.10	27.94 - 14.33	21.05 - 13.60
Excess/Deficient		-0.2	-2.3	0.9	-2.9

*ICMR 2010, NT- Non-Tribal girls, T-Tribal girls

Table 19 elucidated that the nontribal tribal girls from Aralam showed the mean score up to the reference point or excess for each age groups from 10-15yrs (+0.4, +1.5, +1.01, +1.0, +1.2 and 0.2) respectively. In this 11, 12 and 13 years tribal girls were slightly overweight (one percentile level). The nontribal tribal girls from Pulpally got excess or deficit to the mean score of (+1.0, +2.2, +1.5, +0.7, -1.0 and 0.9). In this group, 11 and 12 years tribal girls were overweight (two percentile level). Excess or deficit to the mean score among the tribal girls expressed that they suffered from severe underweight at approximately 2-3 percentile level. Aralam tribal girls secured the scores of -1.5, -0.9, -2.3, -2.2, -2.7 and -2.3 for 11 to 15 years respectively. Pulpally tribal tribal girls scored -2.6, -1.4, -1.5, -2.6, -2.8 and -2.9 for 11 to15 years respectively.

b. Clinical Profile

Nutrition had an important role in disease prevention, and recovery of health. Knowledge of the nutrition interaction is basically considered in treatment. Such intervention can be characterized to enable rational assessment. After physical examination and evaluation of careful history, the influence of diet can be predict logically. Tribal population in Kerala State treated as so sensitive group of people and blood sample assessment is not permitted (Appendix. 5). In this context, the clinical examination was carried out for the selected tribal girls (N=600) and served as hoarding for assessing the nutritional status of the selected tribal girls and are highlighted in Table 20.

Table 20: Clinical Profile

Particulars*	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Eyes								
Pale Lower eyelid	39	24	73	49	43	29	88	59
Retinal hemorrhage	-	-	-	-	-	-	2	1
Blurred vision	9	6	28	19	15	10	37	25
Poor night vision	-	-	7	5	-	-	19	13

Particulars*	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Dry eye (Xerophthalmia)	-	-	6	4	1	1	12	8
Bitot's spots	-	-	3	2	-	-	5	3
Teeth & Gums								
Bleeding gums	7	5	21	14	11	7	38	25
Crowded teeth	9	6	15	10	10	7	20	13
Hair								
Dry hair	12	8	43	28	16	11	51	34
Hair loss	41	27	79	53	32	21	84	56
Dandruff	21	14	63	42	32	21	51	34
Brittle hair	19	13	49	33	24	16	41	27
Discoloration/ flag sign	8	5	76	51	10	7	119	79
Nail								
Koilonychias	4	3	32	21	12	8	51	34
White marks	53	35	68	45	52	35	82	54
Pale nail	49	33	103	69	53	35	119	79
Brittle nail	6	4	61	41	8	5	57	38
Cuticle tear easily	-	-	9	6	7	5	39	26
Mouth								
Canker sores	9	6	17	11	11	7	28	19
Glossitis	7	5	26	17	15	10	31	21
Cheilosis	6	4	19	13	8	5	27	18
Pale lips	41	27	99	66	49	33	114	76
Skin								
Bumps on the back of the arm	1	1	19	13	3	2	21	14
Dry or rough skin	6	4	31	21	5	3	48	32
Nose bleeding	-	-	3	2	-	-	9	6
Dermatitis	-	-	15	10	2	2	34	23

*multiple response, (NT- Non-Tribal girls, T-Tribal girls)

Table 20 described about the clinical symptoms of the nutritional deficiency of selected tribal and nontribal girls. Pulpally tribal girls were in the superior position of nutritional deficiency when compared with other nontribal tribal girls. It was shocked to note that VAD (Vitamin A Deficiency), in terms of poor night vision, Xerophthalmia and Bitot's spots were noted in meagre percent. Anemia was the most observed symptoms among both the tribal and nontribal tribal girls. Study among young girls conducted by Shrinivas (2014)

in Wayanad District showed the result that 97 percent of the young girls were anemic. Thirty four and 21 percent of tribal girls in Aralam and Pulpally area respectively possessed the sign of koilonychia and 41 and 38 percent of the selected tribal girls had brittle nail. Thirty five percent of the nontribal tribal girls had white mark on their nail whereas 45 and 55 percent of the tribal subject from Aralam and Pulpally area respectively had the white mark on their nail. Among the Pulpally tribal girls 59, 79, and 76 percent of them had paleness on eye, nail and lips respectively. Nearly forty nine, 69, and 66 percent of the tribal girls from Aralam showed paleness on eye, nail and lips respectively. Fifty one and 80 percent of the tribal girls respectively from Aralam and Pulpally area showed hair discoloration. Twenty seven and 21 percent of the nontribal tribal girls and 56 and 53 percent of the tribal girls respectively from Aralam and Pulpally exhibited hair loss.

c. Dietary Intake

A comprehensive evaluation is necessary for the assessment of deficit or excess of consumption of nutrients. Young girls, the future mothers need a special concern related to dietary intake (Truswell, 2010).

1. Mean macronutrient consumption

Young girls are growing future so that they need to have more energy and other nutrient for their metabolic and physical activities. From this study, it was observed that the tribal girls were struggled to attain their daily needs of Energy and other nutrients when compared to the nontribal counterparts and discussed in Table 21.

Table 21: Mean macronutrient consumption

Macronutrients		ICMR RDA (2016)	**Aralam (N=300)**		**Pulpally (N=300)**	
			NT (Mean± SD) (n=150)	**T (Mean± SD) (n=150)**	**NT (Mean± SD) (n=150)**	**T (Mean± SD) (n=150)**
Energy (Kcal)	10-12yrs	2010kcal	2020.6±326.9	1677.5±181.0	2112.7±424.5	1578.5±223.5
	Mx - Mn		2986 - 1389	2135 - 1354	2965 - 1369	2113 - 1265
	Ex/Dft		+10.6	-332.5	+102.7	-422.5
	13-15yrs	2330kcal	2428.0±490.3	2195.7±229.9	2431.1±334.0	1730.8±329.0
	Mx - Mn		4169 - 1536	2987 - 1639	3265 - 1496	2651 - 1265
	Ex/Dft		+98	-134.3	-101.1	-599.2
P r	10-12yrs	40.4g	38.9±8.37	24.11±5.0	34.04±6.29	17.76±3.61

	Mx - Mn		62.0 - 22.8	36.4 - 13.4	43.8 - 21.69	26.31 - 13.26
	Ex/Dft		-1.5	-16.3	+6.4	-22.6
	13-15yrs		50.19±6.79	34.24±8.86	47.15±6.56	21.90±5.65
	Mx - Mn	51.9g	67.1 - 28.9	50.4 - 13.54	59.7 - 33.6	34.6 - 12.53
	Ex/Dft		-1.7	-17.7	-4.8	-29
Fat (g)	10-12yrs		35.71±4.95	27.38±3.68	37.15±5.76	19.38±5.47
	Mx - Mn	35g	47.0 - 26.0	36.1 - 15.4	41.6 - 23.45	32.9 - 13.0
	Ex/Dft		-0.7	-7.6	+2.2	-15.6
	13-15yrs		42.29±6.41	28.90±5.33	38.91±7.51	20.55±5.27
	Mx - Mn	40g	61.0 - 28.0	39.8 - 20.3	56.98 - 21.56	46.5 - 13.4
	Ex/Dft		+2.3	-11.1	-1.1	19.5

Mx-Maximum, Mn- Minimum, Ex- Excess, Dft- Deficit, NT- Non-Tribal girls, T-Tribal girls

Tribal girls (10-12 years) from Pulpally showed the severe deficit of Energy requirement (422.5) next to Aralam Tribal girls(-332.5) when compare with nontribal tribal girls. Tribal girls of 13-15 years also suffered from energy scarcity in their daily requirement (-134.3 for Aralam and -599.2 for Pulpally tribal girls). The nontribal girls reached almost near to the protein requirement (-1.5 and -1.71 for the Aralam tribal girls and +6.36 and -4.75 for Pulpally tribal girls). The tribal girls consumed meagre amount of protein (-16.29 and -17.66 for Aralam tribal girls and -22.64 and -29 for Pulpally tribal girls). Pulpally tribal girls had less in fat consumption (-15.62 and19.45). The above table declared that the nontribal girls attained their daily nutrient requirement of energy, protein and fat; whereas the tribal girls struggled a lot to attain their daily nutrient constraint and they were so posterior than the nontribal tribal girls.

2. Mean minerals Intake

All the mineral compounds had very momentous influence on the growth of the young girls. Minerals became the component of the body and participated in regulatory actions of the body system. Even though every minerals had its own particular action in body functioning, Calcium, Iron, Zinc and Magnesium steered loftier position among them and showed in the subsequent Table 22.

Table 22: Mean mineral Consumption

Minerals		ICMR RDA (2016)	Aralam (N=300)		Pulpally (N=300)	
			NT (Mean± SD) (n=150)	T (Mean± SD) (n=150)	NT (Mean± SD) (n=150)	T (Mean± SD) (n=150)
Calcium (mg)	10-12yrs	800mg	699.79±152.60	511.78±112.68	637.20±196.17	266.3±49.96
	Mx - Mn		912.0 - 389.0	669.0 - 358.0	988.67-236.89	397.0 -167.0
	Ex/Dft		-100.2	-288.2	-162.8	-533.7
	13-15yrs	800mg	728.37±141.42	582.49±129.85	791.39±168.02	425.97±247.22
	Mx - Mn		911.0 -388.0	965.0 - 214.0	989.0 - 369.5	865 - 135
	Ex/Dft		-71.6	-217.5	-8.6	-374.0
Iron (mg)	10-12yrs	27mg	22.45±4.75	17.04±3.48	22.68±3.56	13.68±2.06
	Mx - Mn		32.0 - 15.0	23.6 - 10.9	29.65 - 16.0	19.5 - 9.5
	Ex/Dft		-4.6	-9.9	-4.3	-13.3
	13-15yrs	27mg	28.26±4.46	20.65±3.69	23.94±4.57	13.73±2.43
	Mx - Mn		37.0 - 15.0	27.60 - 12.3	36.2 - 14.9	19.5 - 6.48
	Ex/Dft		+1.3	-6.4	-3.0	-13.3
Zinc (mg)	10-12yrs	9mg	4.95±1.92	3.25±1.00	5.84±2.15	4.10±1.09
	Mx- Mn		8.7 - 1.6	5.6 - 1.6	9.6 - 2.3	6.3 - 1.65
	Ex/Dft		-4.1	-5.8	-3.2	-4.9
	13-15yrs	11mg	6.70±2.67	4.92±1.65	7.89±2.49	5.20±1.42
	Mx - Mn		13.25 - 3.1	9.87 - 1.4	13.2 - 2.3	9.25 - 2.36
	Ex/Dft		-4.3	-6.1	-3.1	-5.8
Magnesium (mg)	10-12yrs	160mg	153.21±54.36	148.85±34.88	161.75±22.75	123.53±13.01
	Mx - Mn		268.0 - 51.0	214 - 97)	195.63 - 89.54	186.0 - 125.36
	Ex/Dft		-6.8	-11.2	+1.8	-36.5
	13-15yrs	210mg	211.11±73.75	174.20±42.48	180.87±29.16	152.01±14.75
	Mx - Mn		798.0 - 110.0	354.0 - 101.0	251.36 - 105.26	196.34-123.34

	Ex/Dft		+1.1	-35.8	-29.1	-58.0

Mx-Maximum, Mn- Minimum, Ex- Excess, Dft- Deficit, NT- Non-Tribal girls, T-Tribal girls

Table 22 exposed the fact that the girls from both tribal and nontribal area suffered from mineral deficit in their diet. Pulpally tribal girls were deficit 533.7 (10-12 years) and 374.0 (13-15 years) to their calcium requirements. Aralam tribal girls were deficit 9.9 (10-12years) and 6.4 (13-15years) in their Iron requirement whereas the Pulpally tribal girls (10-12years) and girls of (13-15years) had the same percent (13.3 percent) of deficit. Nearly 6 percent (10-12years) and 6.1 (13-15years) of Zinc deficit among the Aralam tribal girls. A noticed amount of Zinc deficit could be observed among the nontribal girls. That is 4.1 (10-12years) and 4.3 (13-15years) deficit of Zinc among the Aralam nontribal girls and 3.2 (10-12years) and 3.1 (13-15years) deficit of the same among the Pulpally nontribal tribal girls. 36.5 (10-12years) and 58,0 (13-15years) of deficit to Magnesium requirements among tribal girls from Pulpally. Table 20 pointed out that mean mineral intake of nontribal girls (10-12years) were lesser than the same study group. Tribal girls aged between 13 and 15 years girls attained approximately optimum requirement. Both age category of tribal girls failed to attain the mineral requirement as per the ICMR RDA (2016).

3. Mean vitamins Intake

Both the water soluble vitamins and fat soluble vitamins have a substantial role in the growth and development of the young girls. The future mothers requisite to consume enough vitamins for their health as well as the health of their future generation. The collected data revealed that the both age groups (10-12 years and 13-15 years) of tribal young girls had a severe scarcity in their Mean vitamins consumption of their daily dietaries and mentioned in Table 23.

Table 23: Mean vitamin Consumption

Vitamins		ICMR RDA 2016	Aralam (N=300)		Pulpally (N=300)	
			NT (Mean± SD) (n=150)	T (Mean± SD) (n=150)	NT (Mean± SD) (n=150)	T (Mean± SD) (n=150)
Beta-	10-12yrs	4800 µg	4766.8±554.2	3618.10±543.9	4897.8±399.4	2619.3±620.5
	Mx - Mn		5987 - 3421	4568 - 1654	5239 - 3426	3652 - 1369
	Ex/Dft		-33.2	-1181.9	+97	-2780.7
	13-15yrs		5034±800.55	3043.7±1009.4	4055.4±788.7	2841.9±713.4

Vitamins		ICMR RDA 2016	Aralam (N=300)		Pulpally (N=300)	
			NT (Mean± SD) (n=150)	T (Mean± SD) (n=150)	NT (Mean± SD) (n=150)	T (Mean± SD) (n=150)
	Mx - Mn	4800 µg	6937 - 3248	6549 - 1265	6539 - 2369	5236 - 1124
	Ex/Dft		+234	-1756.3	-744.6	-1958.1
Thiamin (mg)	10-12yrs	1.1 mg	1.04±0.28	0.71±0.40	1.14±0.26	0.69±0.27
	Mx - Mn		1.6 - 0.59	1.09 - 0.1	1.37 - 0.57	0.98 - 0.26
	Ex/Dft		-0.1	-0.4	+0.0	-0.3
	13-15yrs	1.2 mg	1.08±0.25	0.69±0.39	0.91±0.22	0.74±3.97
	Mx - Mn		1.69 - 0.10	1.59 - 0.06	1.5 - 0.12	42 - 0..09
	Ex/Dft		-0.1	-0.5	-0.3	-0.5
Riboflavin (mg)	10-12yrs	1.2 mg	1.15±0.27	0.59±0.14	1.16±0.29	0.60±0.33
	Mx - Mn		1.5 - 0.48	0.65 - 0.2	1.46 - 0.46	1.09 - 0.21
	Ex/Dft		-0.1	-0.6	-0.1	-0.6
	13-15yrs	1.4 mg	1.34±0.29	0.90±0.39	1.07±0.28	0.61±0.34
	Mx - Mn		1.95 - 0.58	1.59 - 0.26	1.42 - 0.26	1.09 - 0.15
	Ex/Dft		-0.1	-0.5	-0.3	-0.8
Niacin (mg)	10-12yrs	13 mg	11.14±2.21	8.28±1.95	13.35±1.98	6.72±1.57
	Mx - Mn		14.98 - 6.54	10.25 - 3.65	16.50 - 6.9	7.58 - 1.95
	Ex/Dft		-1.9	-4.7	+0.4	-6.3
	13-15yrs	14 mg	15.30±2.00	7.30±2.36	12.97±3.22	6.05±1.31
	Mx - Mn		19.5 - 9.87	10.98 - 3.24	19.87 - 5.95	8.45 - 3.25
	Ex/Dft		+1.3	-6.7	+1.0	-8.0
Vitamin C (mg)	10-12yrs	40 mg	43.29±9.81	33.37±9.90	39.81±5.97	26.74±4.74
	Mx - Mn		68.6 - 26.6	53.54 - 15.36	53.2 - 26.95	34.2 - 12.7
	Ex/Dft		+3.3	-6.6	-0.2	-13.3
	13-15yrs	40 mg	50.54±13.87	31.10±12.22	41.61±10.38	28.30±4.16
	Mx - Mn		85.64 - 30.0	63.24 - 2.36	78.95 - 24.98	32.7 - 13.25
	Ex/Dft		+10.5	-8.9	+1.6	-11.7
Folate (µg)	10-12yrs	140 µg	128.67±29.94	97.53±44.64	161.56±41.85	125.10±11.21
	Mx - Mn		165.0 - 36.8	153.29 - 35.63	364.0 - 123.56	153 - 110
	Ex/Dft		-11.3	-42.5	+21.6	-14.9
	13-15yrs	150 µg	160.40±23.76	117.61±36.41	158.95±24.54	140.78±25.86
	Mx - Mn		210.36 - 124	156.98 - 45.69	261.07 - 125.4	195 - 96
	Ex/Dft		-10.4	-32.4	+9.0	-9.2

Mx-Maximum, Mn- Minimum, Ex- Excess, Dft- Deficit, NT- Non-Tribal girls, T-Tribal girls

Aralam tribal girls had a deficit of 1181.9 (10-12years) and 1756.3 (13-15years) in beta-carotene intake and among Pulpally tribal girls it was 2780.7 µg (10-12years) and 1958.1

µg (1315years). Pulpally tribal girls had a deficit of 0.28 µg (10-12years) and 0.46 µg (13-15years) in their Thiamin intake. While there was a negligible amount of deficit to the same among both of the nontribal tribal girls. Both tribal girls (0.61and 0.5 in Aralam and 0.6 and 0.79 in Pulpally respectively) underwent insufficiency to their riboflavin requirement and Niacin requirement (4.72 and 6.7 in Aralam; and 6.28 and 7.95 in Pulpally). There was an enormous gap between the Vitamin C requirement and consumption among the Pulpally tribal girls (13.26 µg and 11.7 µg). Folate consumption was very insufficient among the Aralam tribal girls (42.47 and 32.39). The results showed that the nontribal girls reached the beta-carotene and vitamin C requirements and nontribal subject found difficulty to reach the limit. Both the nontribal and tribal girls were hard to attain thiamin and riboflavin in both age groups. Both age groups of tribal girls and 10-12years group of nontribal girls felt deficit in conquering the nutrients of niacin and folate.

d. Dietary habits

Tribals had their own dietary and life style pattern which entirely different from the nontribal population. Food skipping pattern, the type of food they consumed, time of food consumption, methods of cooking, and snacking pattern was very different among the tribal population and are discussed in the following pages.

1. Food skipping pattern

Food is essential for human survival. Food is now considered a status symbol, social icon, and part of that luxury; On the contrary, many of the population are starving. Many of the tribal population suffered from the scarcity of enough food for their existence. In this study it was noticed that none of the tribal girls consuming extra food for satiety instead all of them consumed food to control their hunger. Tribal girls slept early and stay up late. Around 50 percent of them did not have the habit of having breakfast and some of them consumed the left over rice with raw onion and green chilli. Government schools provided the lunch (rice with sambar/egg/chickpea) for the school to the tribal and nontribal children to fulfil their one third of their nutritional requirements.

Table 24: Food skipping pattern

Skipping food	Aralam (300)				Pulpally (300)			
	NT	%	T	%	NT	%	T	%
Don't Skip any meal	78	52	12	8	85	57	8	5
Skipped any one meal daily	45	30	61	41	41	27	59	39
Skipped any two meals daily	27	18	77	51	24	16	83	55
Skipped breakfast only	43	29	76	51	38	25	73	49
Skipped dinner only	29	19	62	41	27	18	69	46

NT- Non-Tribal girls, T-Tribal girls

Majority of the nontribal girls (52 and 57 percent) in both the study areas respectively, did not skip any part of the meal or even they tried to skip any meal, the elders in their home tried to convince them to have the food. Forty one and 39 percent of the selected tribal girls respectively from Aralam and Pulpally, daily skipped at least one meal in a day. This was happened because of the irregularity in their time habituation. Less than 10 percent of the tribal girls had all the meals daily. Majority (51 and 55 percent) of the tribal girls in both study area skipped two meals daily. Nearly 51 and 49 percent of the tribal girls in Aralam and Pulpally skipped their breakfast every day. Tribal girls did not have any daily time table. They got up very late and had no proper breakfast and rushed to school. All the selected tribal girls, including tribals, were given lunch from their schools. Forty one and 46 percent of tribal girls went to bed early and skipped dinner regularly. Tribal girls, especially the family with more members did not have enough food to eat. There were many other factors which affected the skipping pattern of selected tribal girls, which were drinking habit of parents, card playing, clash in the home between parents or other family members and severe health issues of any of family members. It was noticed that the tribal girls consumed whatever was available in the house. They did not have any food preferences or choices in their daily dietary pattern.

2. Daily water consumption pattern

Our body comprehends around 60 percent of water. The body fluids have many functions in the body like absorption, saliva creation, digestion, regulating temperature, nutrient transportation, and circulation. In this study, it was cleared that the selected tribal girls sluggish to have enough water as per their need and given in Table 25.

Table 25: Daily water consumption pattern

Daily water consumption	Aralam				Pulpally			
	NT	%	T	%	NT	%	T	%
>11 glasses	54	36	0	0	49	33	0	0
8-10 glasses	62	41	8	5	48	32	14	27
5-7 glasses	22	15	51	34	34	23	61	41
<4 glasses	12	8	91	61	19	13	75	50

(1 glass= 200ml), NT- Non-Tribal girls, T-Tribal girls

Table 25 disclosed that 61 and 50 percent of the selected tribal girls refused to have enough water and they had less than four glass of water daily. Thirty four and 41 percent of the tribal girls of Aralam and Pulpally respectively consumed 5-7 glasses of water daily. Forty one and 32 percent of the nontribal girls consumed 8-10 glasses of water daily. None of the tribal girls consumed more than two liters of water but 36 and 33 percent of the nontribal girls in both study area respectively consumed more than two litters of water daily. Nontribal girls showed better status in their water consumption pattern than tribal girls. Tribal girls were worried to consume more water because of the lack of attached latrine in their home or no latrine at all. Government provided toilet to every tribal houses, but in fact very few tribals used that toilet properly. The investigator noted that many of the tribals used their toilet to store their things including coconuts, fire woods and other things and for defecation they used open space.

3. Food consumption frequency

Food consumption frequency is governed by the person's choice. It will influenced by inter household strata, community situations, economic and market factors, socio-cultural backgrounds, geographical and environmental factors. Frequency of food consumption lead to food preferences and choices of selected girls (Table 26).

Table 26. Frequency of food consumption among nontribal girls

Food items	Aralam (nontribal) (N=300)					Pulpally (nontribal) (N=300)				
	Daily N (%)	4-5 times (Weekly) N (%)	2-3 times (weekly) N (%)	Rarely N (%)	Never N (%)	Daily N (%)	4-5 times (Weekly) N (%)	2-3 times (weekly) N (%)	Rarely N (%)	Never N (%)
Cereals	150 (100)	-	-	-	-	150 (100)	-	-	-	-
Pulses	21 (14)	32 (21)	43 (29)	38 (25)	16 (11)	18 (12)	32 (21)	52 (35)	39 (26)	9 (6)

GLV	-	57 (38)	80 (53)	13 (9)	-	-	49 (33)	73 (49)	24 (16)	5 (3)
OV	20 (13)	29 (19)	53 (35)	48 (32)	-	12 (8)	23 (15)	106 (71)	21 (14)	-
R & T	-	-	78 (52)	55 (37)	17 (11)	-	-	69 (46)	61 (41)	20 (13)
Oil/fat	98 (65)	49 (33)	3(2)	-	-	105 (70)	45 (30)	-	-	-
Fruits	-	23 (15)	82 (55)	45 (30)	-	-	31 (21)	96 (64)	23 (15)	-
Egg	-	-	76 (50)	65 (43)	9 (6)	-	-	83 (55)	62 (41)	5 (3)
Meats/ fish	36 (24)	72 (48)	37 (25)	5(3)	-	47 (31)	59 (39)	35 (23)	2 (1)	7 (5)
Sugar	150 (100)	-	-	-	-	150 (100)	-	-	-	-

n-Numbers, Parentheses indicate percentage, NT- Non-Tribal girls, T-Tribal girls

Table 26 described that cent percent of the selected girls in the both the study areas respectively consumed cereal foods and sugar every day. Fifty three and 49 percent of the nontribal girls consumed green leafy vegetables, 35 and 71 percent of the selected girls in both area consumed other vegetables, 52 and 46 percent of the selected girls consumed roots and tubers, 55 and 64 percent of girls consumed fruits, and 51 and 55 of them consumed egg 2-3 days in a week respectively from Aralam and Pulpally area. Fourteen and 12 percent of them consumed pulses, 13 and eight percent consumed other vegetables and 65 and 70 consumed oils and fats every day. Eleven and six percent of them never consumed pulses, 11 and 13 of them never consumed roots and tubers out of fear of gastric discomfort. Six and three percent of them did not like egg and some of the selected girls had symptoms of food allergies when they ate eggs.

Table 27. Food consumption frequency among tribal girls

Food item	**Aralam tribal (N=300)**					**Pulpally tribal (N=300)**				
	Daily N (%)	4-5 times (Weekly) N (%)	2-3 times (weekly) N (%)	Rarely N (%)	Never N (%)	Daily N (%)	4-5 times (Weekly) N (%)	2-3 times (weekly) N (%)	Rarely N (%)	Never N (%)
Cereals	150 (100)	-	-	-	-	90 (60)	60 (40)	-	-	-
Pulses	-	-	78 (52)	35 (23)	37 (25)	-	-	98 (65)	34 (23)	18 (12)

GLV	-	49 (33)	98 (65)	3(2)	-	-	73 (49)	53 (35)	24 (16)	-
OV	-	-	19 (13)	131 (87)	-	-	-	23 (15)	127 (85)	-
R & T	-	-	28 (19)	96 (64)	26 (17)	-	16 (11)	76 (51)	58 (39)	-
Oil/fat	-	-	65 (43)	73 (49)	12(8)	-	-	79 (53)	65 (43)	6 (4)
Fruits	-	-	52 (35)	98 (65)	-	-	-	49 (33)	101 (67)	-
Egg	-	-	-	114 (76)	36 (24)	-	-	-	138 (92)	12 (8)
Meats/ fish	-	-	21 (14)	118 (79)	11 (7)	-	-	37 (25)	113 (75)	-
Sugar	-	26 (17)	121 (81)	23(15)	-	-	21(14)	90(60)	39(26)	-

n-Numbers, Parentheses indicate percentage, NT- Non-Tribal girls, T-Tribal girls

Table elaborated about the food frequency pattern among the selected tribal girls. Cent percent of the Aralam tribal girls and 60 percent of the Pulpally tribal girls had cereal based foods every day. Fifty two and 65 percent had pulses, 65 and 35 percent had green leafy vegetables, 81 and 60 percent had sugar 2-3 days in w week. Eighty seven and 85 percent had other vegetables, 64 and 39 percent consumed roots and tubers, 49 and 43 percent of them consumed oils, rarely. Sixty five and 67 percent had fruits, 76 and 92 percent consumed egg, 79 and 75 percent of them had meat and fish based on the availability. (The investigator observed that among the tribal community the girls were considered inferior to boys. The first food preference went to the boys 'choices. The main portion of the meal was reserved for boys. Because their parents believed that the boys are future earning member of the family and are financial supporter.

4. Mid-Day Meal Program (MDMP) for the children

The tribal school authorities of the selected area tried to extend MDMP food to all of the high school students to improve the attendance and improve the health status. The menu followed in MDMP is given in Table 28.

Table 28: The menu followed in the Mid-Day Meal Programme

Day	Suggested meal	Number of girls benefited (%)
Monday	Rice + Green Gram & Coconut dish+ Vegetable curry (Sambar)	100

Tuesday	Rice + Vegetable mix (avial) + Spicy soup/ pickles	
Wednesday	Rice + Vegetable curry+ Green Gram/red gram & Coconut	
Thursday	Rice + Green Gram/ Dal curry +Vegetable mix (avial)	
Friday	Rice + Bengal gram or Green Gram+ Vegetable curry (Sambar)	

Source: Kerala MDMP Committee Annual plan Report (1998)

Table 28 described about the menu recommended by the Kerala MDMP committee reports' for the schools. It recommended nutritious foods to the students which are valuable to fulfil their nutritional requirements. It was observed that cent percent of the tribal and nontribal girls benefited from this MDMP during working days. The investigator noticed that the visited schools tried to follow the menu as possible as they could. Even though they had some funding issues, teachers took the initiation to continue the same menu. Some social service societies are also assisting the school for this persistence. Other suggestions of the committee are given below.

- Should provide Banana/ Egg at least once in a week
- Should provide Milk (150 ml) at least twice in a week

It was interesting to notice and witnessed by the teachers and the investigator that the school enrolled full attendance on the day of providing egg and milk to the students, especially tribal girls.

d. Menstrual status

Even today, there were many taboos and restrictions clouded with the menstruation and menstrual rehearses in the selected area. These led the young girls to ignore the scientific actualities and healthy hygienic practices. These practices led in to negative health consequence occasionally.

1. Age of puberty

Puberty is the attainment of sexual maturity and the stepping stone towards the fertility. The time of puberty is varied among different people according to their hereditary and genera. It normally occurred in girls in the age range of 10 to 14 years.

Table 29: Age of puberty among the selected girls

Particulars	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Menstruation attained								
10-12 years	36	24	19	13	31	21	16	10
13-15 years	85	57	91	61	78	52	88	59
Total	**121**	**81**	**110**	**73**	**109**	**73**	**104**	**69**
Age of puberty								
9 years	11	7	-	-	6	4	-	-
10 years	19	13	6	4	15	10	4	3
11 years	21	14	15	10	20	13	7	5
12 years	48	32	29	19	44	29	17	11
13 years	22	15	51	34	19	13	29	19
14 years	-	-	9	6	5	3	47	31
Total	**121**	**81**	**110**	**73**	**109**	**73**	**104**	**69**

NT- Non-Tribal girls, T-Tribal girls

From this Table 29, it was cleared that 32 and 29 percent of the nontribal girls from Aralam and Pulpally respectively attained the puberty at the age of 12 years, whereas 34 percent of the Aralam tribal girls attained at the age of 13 years and 31 percent the Pulpally tribal girls attained the puberty at the age of 14 years. The nontribal girls started to conquer the puberty from the age of nine whereas the tribal girls attained puberty at the age of 10 years.

2. Special foods included or avoided

Food taboo is a kind of proscription to consume certain food during some life time (e.g. pregnancy) or on occasion (e.g. menstruation). The word taboo means ‘forbidden’ or ‘offensive’. Nowadays it is interlinked with religious or traditional connotations. Food taboos could be observed throughout the society in one or another way. These unwritten precepts now gradually spread though out the communities and regulate human behaviour. The unawareness of the society about the reality might cause severe health issues in the future. It is observed in this study that, inclusion of some food stuffs in the menstrual time as a precaution from cramps and other abdominal irritability. And avoiding some food stuffs as the part of believes that the inclusion of some food stuffs (Papaya and Pine apple) may cause abortion in the future, severe cramps (sour fruits including citrus fruits), and excess bleeding (iron rich foods) and are depicted in Table 30.

Table 30: Special foods included or avoided

Food included and excluded	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Food included *								
Fenugreek (boiled)	29	33	12	11	37	34	2	2
Ajwain seeds (whole/boiled)	16	13	-	-	9	8	-	-
Cumin seed (boiled)	19	16	-	-	14	13	-	-
Cardamom	16	13	-	-	12	11	-	-
Clove	12	10	-	-	8	7	-	-
Balsam leaves (Boiled)	3	3	26	24	-	-	19	18
Black coffee (with/without ginger)	16	13	37	34	24	22	18	17
Black tea	24	20	16	15	17	16	27	26
Alcohol/Wine	3	3	29	26	-	-	33	32
Food avoided *								
Pine apple	65	54	71	65	53	49	45	43
Lemon/citrus fruit	43	36	26	24	56	51	31	30
Mango (other fruits with sour taste)	21	17	34	31	43	39	46	44
Papaya	79	65	81	74	49	45	75	72
Tapioca	31	26	19	17	27	25	17	16
Potato	23	19	24	22	37	34	16	16
Dal/pulses	29	33	12	11	16	15	11	11
Meat/fish/egg	5	4	46	42	11	10	57	55
Pomegranate/dates (iron rich food)	47	39	12	11	41	41	9	9

*Multiple responses, NT- Non-Tribal girls, T-Tribal girls

Table 30 described about the inclusion and exclusion of food items during the menstrual periods. It revealed that 33 and 34 percent of the nontribal girls from Aralam and Pulpally area respectively consumed Fenugreek as such, or fenugreek boiled water during menstruation. They believed that it was helpful to reduce the menstrual cramps. Thirty four percent of the Aralam tribal girls preferred to have dried Ginger Coffee (Chukku kaappy) during menstruation as a pain reliever. Twenty four and 18 percent of the tribal girls liked to consume boiled balsam leaf water for the relief. It was surprised to notice that 26 and 32 percent of the tribal girls consumed alcohol during menstruation to control body cramps. Fifty four and 49 percent of the nontribal girls and 65 and 43 percent of the tribal girls avoided pine apple and 65 and 45 percent of the nontribal girls and 73 and 72 percent of the tribal girls restricted papaya during menstrual flow due to the fear of abortion in future. Thirty six and 51 percent of the nontribal girls and 24 and 30 percent of the tribal girls restricted citrus

fruit and 17 and 39 percent of nontribal girls and 44 and 31 percent of the tribal girls constrained fruits with sour taste (e.g. .Raw Mango) due to the fear of excess blood loss.

3. Reasons for inclusion and exclusion of food items

While investigating about the inclusion and exclusion of food items among the selected girls, it was noticed that the reasons for inclusion or exclusion of particular food items was little different among the tribal and nontribal girls.

Table 31: Reasons for the inclusion and exclusion of food items

Food included and excluded	Reasons	
	Nontribal tribal girls	Tribal girls
Food included		
Fenugreek (boiled)	Pain reliever	Pain reliever
Ajwain seeds (whole/boiled)	Relief from gastric discomforts	No
Cumin seed (boiled)	Pain reliever/ gastric discomforts	No
Cardamom	Refresher	No
Clove	Refresher	No
Balsam leaves (Boiled)	Pain reliever	Muscle relaxer
Black coffee (with/without ginger)	Headache reliever	Abdominal comforter
Black tea	Headache reliever	Abdominal comforter
Alcohol/Wine	Abdominal cramp reliever	Whole body menstrual cramp reliever
Food excluded		
Pine apple	Leads to abortion in future	Lead to abortion in future
Lemon/citrus fruit	Initiator for bleeding	Initiator for bleeding
Mango (other fruits with sour taste)	Leads to excess bleeding	Leads to excess bleeding
Papaya	Leads to abortion in future	Leads to abortion in future
Tapioca	Produce gastritis and leads to excess abdominal cramps	Produce gastritis and leads to excess abdominal cramps
Potato	Produce gastritis and leads to excess abdominal cramps	Produce gastritis and leads to excess abdominal cramps
Dal/pulses	Produce gastritis and leads to excess abdominal cramps	Produce gastritis and leads to excess abdominal cramps
Meat/fish/egg	Difficult to digestion	Part of traditional rituals (fear of tribal Gods and their curse)

Pomegranate/dates (iron rich food)	Foods which rich in iron may produce more blood and loss it through menstrual flow	No particular reason but they heard that it is not a good practice and not affordable

The above data explained about the mind setup of the selected tribal girls towards the inclusion and exclusion of special foods during menstrual cycle. Even though Table 31, is self-explanatory, it was noticed that some of the nontribal girls consumed spices like cardamom and clove as mouth refresher to get rid of from the feeling of vomiting. But none of the tribal girls impersonating these food stuffs. The nontribal girls tried to avoid the consumption of pomegranate and dates during menstruation out the fear of excess menstrual flow. Tribal girls did not have the feasibility to get the pomegranate or dates but they had the same idea that to refuse the consumption of iron rich foods by the same reason. While asked about it, the tribal girls witnessed about the influence with nontribal companions.

4. Sources of information

There are so many factors which influence young girls' attitude towards the nutrition as well as hygiene. School teachers were considered as the trusted resources of information. It was observed that the television advertisements, peer group sharing and sharing from the family members especially the perceptions of the mother had a positive impact on the attitude and practices of both tribal and nontribal girls.

Table 32: Sources of information among the selected tribal girls

Sources of information*	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Schools and teachers	64	43	57	38	72	48	54	36
Books and magazines	24	16	16	11	34	23	9	6
Family members and parents	35	23	67	45	46	31	59	39
Social media	89	59	13	9	90	60	10	7
Peer group	134	89	145	97	121	81	128	85

*multiple responses

As per the data tabulated, it was cleared that the main source of information for the selected tribal girls were peer group. Majority (89 and 81 percent of the nontribal and 97 and 85 percent of tribal girls in both the study area) trusted on peer group for the source of information. Forty three and 48 percent of the nontribal girls and 38 and 36 percent of the

girls attained information from the schools and the teachers. Fifty nine and 60 percent of the nontribal girls achieved their knowledge from Social Medias whereas 45 and 39 percent of the tribal girls looked up on their parents and their family members especially mothers and elders for the information which they needed to practices for the effective health and hygiene.

5. Menstrual discomforts

Majority of the young girls endured their menstrual periods as normal days without any embarrassments. Nearly 50 percent of the selected tribal girls had severe pain and extreme feebleness during those days. These are depending on the health status of an individual. In this study it was noticed that many of the tribal as well as nontribal girls suffered from menstrual discomforts and the details elaborated in Table 33.

Table 33: Menstrual Discomforts of the selected tribal girls

Menstrual discomforts	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Pre/post menstrual syndromes*(PMS)	59	49	46	42	58	53	41	39
Dysmenorrhea*	58	48	48	44	56	51	43	41
Menorrhagia	12	10	10	9	14	13	9	9
Polymenorrhea	19	16	21	19	24	22	18	17
Oligomenorrhea	24	20	27	25	23	21	25	24
Metrorrhagia	35	29	24	22	29	27	20	19
Hypomenorrhea	12	10	11	10	13	12	10	10

* Multiple response , NT- Non-Tribal girls, T-Tribal girls

Table 33 depicted that the menstrual discomforts experienced by the selected tribal girls. Pre/post menstrual symptoms like tiredness, pain on breast, cramps, feeling of freeze on legs and hands, mood swings and stress before or after the menstrual cycle was found severe among 49 and 53 percent of the nontribal and 42 and 39 percent of the tribal girls respectively from Aralam and Pulpally panchayat. Forty eight and 51 percent of the nontribal and 44 and 41 percent of the tribal girls suffered from dysmenorrhea and associated symptoms like severe cramps, stress, depression, and amnesia during menstrual periods. Sixteen and 22 percent of the nontribal girls and 19 and 17 percent of the tribal girls experienced Polymenorrhea (recurrent but uneven episodes of uterine bleeding <21 days). Nearly ten and 13 percent of the nontribal and nine and 9 percent of the tribal girls endured menorrhagia (extreme amount and duration of bleeding but befalling in regular intermission),

20 and 22 percent of the nontribal girls and 25 and 24 percent of the tribal girls tolerated Oligomenorrhea (menstruation occurring with the intermission of more than 35 Days), 29 and 27 percent of the nontribal girls and 22 and 19 percent of the tribal girls had Metrorrhagia (irregular intervals of menstruation and cannot predict the days anyways), and 10 and 12 percent of the nontribal and 10 and 10 percent of the tribal girls had Hypomenorrhea (menstrual period is regular but the amount of blood is very less than normal). Distribution of the menstrual discomforts depicted in Figure 1.

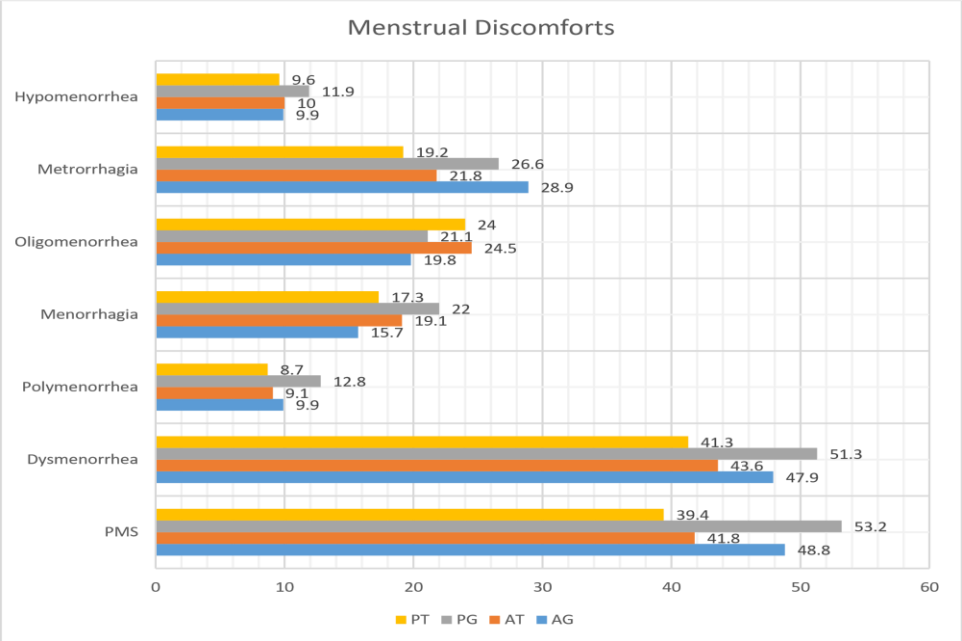

Figure. 1

6. Types of absorbent used

There were different types of menstrual absorbents available in the market from cloth pad to menstrual cup. The affordability was varies among the selected tribal girls. Mainstream of the nontribal girls used sanitary napkin as their menstrual absorbent because they felt this as safety and comfortable. Utmost of the tribal girls never seen such type of pad in their life time. It was noticed that, economical status had a great influence on the hygienic practices among the selected tribal girls.

Table 34: Types of absorbent used by the girls

Absorbent used		Aralam (N=300)				Pulpally (N=300)			
		NT (n=150)	%	NT (n=150)	%	NT (n=150)	%	NT (n=150)	%
Sanitary napkin	Whisper Gel ultra	28	23	-	-	16	15	-	-
	Whisper cotton	19	16	-	-	14	13	-	-
	Stayfree Gel	21	17	-	-	23	21	-	-
	Stay free cotton	22	18	2	2	17	16	-	-
	Sofy	12	10	-	-	8	7	-	-
	Bella	4	3	-	-	-	-	-	-
	Don't know the brand name	7	6	7	6	19	17	-	-
	Total	113	93	9	8	97	89	-	-
Cloth	Cloth pad (reusable)	2	2	-	-	3	3	-	-
	Cloth pad (one time use)	3	2	-	-	5	5	-	-
	Cloth regular wash and reuse	3	2	101	92	4	4	88	85
	Total	8	7	101	92	12	11	88	85
Other		-	-	-	-	-	-	19	18

NT- Non-Tribal girls, T-Tribal girls

Table 34 highlighted the absorbent used by the selected tribal girls. Almost all the nontribal girls from both area (93 and 89 percent from Aralam and Pulpally respectively) preferred the sanitary pad as the menstrual absorbent. Only Very few, eight percent of tribal girls used the sanitary pad. Majority of the selected tribal girls did not known and had seen never the sanitary napkin but heard about it from special programs or from television advertisements. Around 60 percent of the nontribal girls were scared to use cloth pad because of its leakage. 92 and 85 percent of the tribal subject used cloth in their menstrual periods and they used and reused it until tore. The distracted results in this study, were 18 percent of the tribal girls from Pulpally area used paper, waste cloth, hay, unused polyester cloths and so on as their menstrual absorbent and preferred to dip themselves in water more time to remove/prevent menstrual discharge.

7. Method of cleaning and drying the menstrual absorbent

The nontribal girls did not bother about the cleaning and washing of their absorbent. Only seven and 11 percent used cloth as their absorbent. They washed it with detergent and dried it well. But in the case of tribal girls they had many beliefs regarding menstruation. The menstrual cloth should be hidden from other members and it was prohibited to dry this cloth as other cloths. So most of them kept these cloth inside the room itself or other shades. Some of the tribal girls thought that the exposure of menstrual cloth before sunlight is a curse. Tribal girls restricted to talk with other gender during menstruation.

Table 35: Method of washing and drying the menstrual cloths

Method of washing and drying the menstrual cloths	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Proper wash with detergent and drying under sunlight	5	4	18	16	7	6	13	13
Washed with detergents and shade drying	3	3	61	56	5	5	42	40
Washed without detergents and sun drying	-	-	13	12	-	-	21	20
Washed without detergent and shade drying	-	-	9	8	-	-	12	12

NT- Non-Tribal girls, T-Tribal girls

The data revealed that 56 percent of the Aralam tribal girls and 40 percent of the Pulpally tribal girls never dried their menstrual absorbent under the sunlight. Twelve percent of the Aralam tribal girls and 20 percent of the Pulpally tribal girls did not use detergent for washing menstrual cloth. They were thought that the detergent using as unhealthy and it produced itching on the private parts. Eight and 12 percent the tribes never used soap or dried their menstrual clothes under sunlight and were preferred to wash with water and shade dried the clothes.

8. School skipping array during menstrual period

Many of the tribal girls did not go to the school during their menstrual period. The main reasons observed were the menstrual cramps and lack of proper menstrual absorbent and other believes among the selected tribal girls. Nontribal girls did not care much about it because they used medicines to reduce the pain or they found another homemade remedies to overcome these types of painful situations.

Table 36: Skipping of school at the time of menstruation

School skipping array during menstrual period	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Did not skip	98	81	70	64	86	79	36	35
Very rarely (not every month)	12	10	18	16	16	15	14	14
1-2 days (every month)	11	9	13	12	7	6	19	18
3-4 days (every month)	0	0	9	8	0	0	21	20
≥5 days (every month)	0	0	0	0	0	0	14	14

NT- Non-Tribal girls, T-Tribal girls

Table 36 cleared that most of the tribal girls did not attend their classes as compared to their nontribal colleagues. The main reason for the dearth was the improper menstrual absorbent and menstrual cramps. Some of the nontribal tribal girls (nine and six percent from Aralam and Pulpally respectively) refused to go to school because of their menstrual cramps whereas the main reason of the school loafers among the tribal girls (20 and 52 percent)were the lack of proper menstrual absorbent. 12 and 18 percent of the tribal girls skipped one or two days and 8 and 20percent of them skipped three or four days in every month. Fourteen percent of the Pulpally tribal girls skipped almost five days in a month because of menstrual cramps as well as the lack of proper absorbent. The tribal girls used cloth materials as their absorbent, even though they went to school they cannot change their absorbent in proper time and countersigned that they were leaked during menstruation and the dress were stained out of it. They witnessed that they were suffering from extreme itching and other exterior irritability during menstruation.

e. Psychological commotion of the selected girls

Young girls suffered many kinds of psychological discomforts like stress, depression, nervousness, insomnia, and frustration (Table 37).

Table 37: Psychological commotion of selected girls

Psychological commotion *	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
Stress	112	75	110	73	98	65	109	73
Depression	28	19	19	13	31	21	16	11
Nervousness	38	25	31	21	51	34	43	29
Insomnia	19	13	54	36	31	21	61	41
Frustration	49	33	103	69	56	37	106	71

*multiple response, NT- Non-Tribal girls, T-Tribal girls

The results were surprised to note that the girls in the age of 10-15years experienced from different types of psychological commotion. Both the tribal and nontribal girls had the problems in equal intensity. Around 75 percent of girls anguished from stress. Ten to 20 percent of the girls experienced depression, in the range of 20-25 percent of tribal and nontribal from Aralam and 25-35 percent of tribal and nontribal girls from Pulpally suffered from nervousness. Insomnia was uppermost among tribal population i.e. 41 percent in Pulpally and 36 percent in Aralam. Around thirty percent of nontribal in Aralam and 21 percent of nontribal in Pulpally were distressed from insomnia and are depicted in Figure 2.

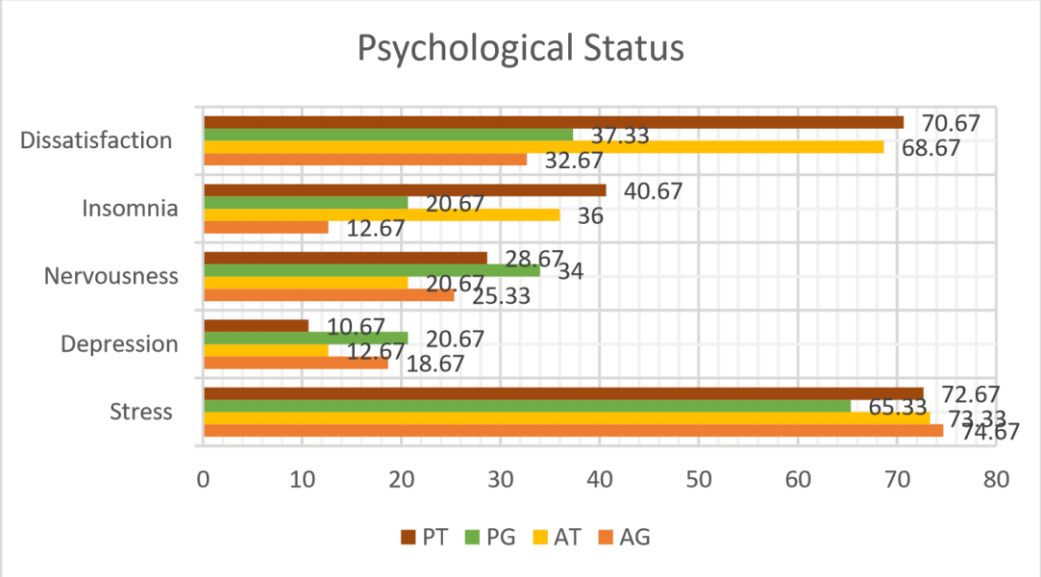

Figure. 2

C: Evaluation of nutritional and reproductive health awareness among the selected tribal girls

Nutrition and menstrual hygiene were the both sides of the same coin in the life of young girls. Socio economic background, dietary and life style pattern are the major modifiable risk factors in prevention of non-communicable life style related diseases or disorders. Imparting nutrition and health education among the young girls and women to adopt healthy food habits, proper water consumption, adoption of physical activities/exercise/yoga, relaxation of psychological stress and strain, regular medical checkup, avoiding alcoholism, chewing Tobacco and so on will have greater influence on the health status of the vulnerable group of population especially young girls. In healthy dietary habits with more nutritious foods especially available at their door steps, seasonal and low cost food items will certainly benefit the vulnerable population and free from the burden of life style related health problems. Simple life style modification with proper diet and physical activity will pave the way for better promotion of health status of the young girls and thereby future generation health. With these views, the nutritional and reproductive health awareness was created and assessed among the selected tribal girls. Gathered data are presented in the following pages.

a. Evaluation of nutritional knowledge of the selected girls

It was observed that the nutritional knowledge among the selected tribal girls were very poor. Both the tribal and nontribal girls failed to follow healthy dietary practices. It affected severely the overall health status of the selected tribal girls. Effect of nutritional and health education and its reflection on health status among the selected girls was assessed using specially constructed interview schedule. There was a strong difference in the nutritional knowledge between the tribal and nontribal girls and it is profoundly evidenced by ANOVA and depicted in table 38.

Table 38: Mean scores secured for nutritional variables by the selected girls

Variable Content	Total Score	Mean score attained			
		Aralam (NT)	Aralam (T)	Pulpally (NT)	Pulpally (T)
Knowledge on nutrients and health	6	1.11±0.48	1.06±0.69	2.36±0.56	0.66±0.07
Knowledge on deficiency diseases	6	2.13±0.04	0.9±0.56	2.06±0.69	1.08±0.96
Knowledge on healthy lifestyle pattern	7	2.12±1.26	0.96±0.12	2.09±0.82	0.86±0.19
Knowledge on nutrients	6	2.34±0.63	0.95±0.91	1.46±0.08	1.09±0.58
Total	**25**	**7.70±2.41**	**3.87±2.28**	**7.98±2.15**	**3.69±1.81**

NT- Non-Tribal girls, T-Tribal girls

Created awareness on nutritional knowledge among the selected girls were in terms of importance of foods, nutrients, health promotion concentrating on mainly for variables that were general knowledge regards nutrients, health promotion, deficiency disorders, prevention, nutrient sources, and healthy life style. The nontribal girls from Pulpally acquired mean score of 7.98 (with a standard deviation of 2.15) than Aralam nontribal girls secured mean score of 7.70 (with a standard deviation of 2.41). Whereas Aralam tribal girls secured the mean score of 3.87 (with a standard deviation of 2.28) and Pulpally tribal girls netted the mean score of 3.69 (with the standard deviation of 1.81). It was cleared that tribal girls secured the least mean score when compared to the girls from nontribal counterparts. This reflected the poor knowledge in the field of food, nutrition and health and was expressed in terms of the range of marks obtained (Table 39).

Table 39: Nutritional awareness of the selected tribal and nontribal girls

Range of marks obtained	Aralam (N=300)				Pulpally (N=300)			
	NT (n=150)	%	T (n=150)	%	NT (n=150)	%	T (n=150)	%
21-25 (Excellent)	-	-	-	-	-	-	-	-
16-20 (Very good)	-	-	-	-	-	-	-	-
11-15 (Good)	13	9	-	-	8	5	-	-
6-10 (fair)	117	78	29	19	121	81	12	8
1-5 (Poor)	20	13	121	81	21	14	138	92

NT- Non-Tribal girls, T-Tribal girls

Table 39 classified the tribal girls in to five category based on to the scores secured by the selected girls in the study groups. It was cleared that none of the tribal and nontribal girls acquired the excellent to good scores. Nearly nine percent of the nontribal girls from Aralam area and five percent of the Pulpally nontribal girls scored mark in the range of 11-15. Seventy eight percent of the nontribal girls from Aralam and 81 percent of the Pulpally tribal girls secured 'fair' score (6-10) and it was shocked to note that 81 percent of Aralam tribal girls and 92 percent of the Pulpally tribal girls recorded only 'poor' scores and reflected the poor knowledge of food, nutrition and health whereas the nontribal girls secured better range of mark than tribal girls..

Hypothesis H0.1: There is no significant difference between the nutritional knowledge of the tribal and nontribal girls from the same locale

Alternative hypothesis H1.1: There is a significant difference between the nutritional knowledge of the tribal and nontribal girls from the same locale

There was one null hypothesis (Hypothesis H0.1) and an alternative hypothesis framed before the study to assess the nutritional knowledge level between the tribal and nontribal tribal girls. For evaluating this, the investigator tested one-way ANOVA. Table 40 enlightened the variances.

Table 40: One-way ANOVA for evaluating differences in nutritional knowledge level of the selected girls.

Nutritional Awareness	Aralam (NT Vs T)	Pulpally (NT Vs T)	Aralam NT Vs Pulpally NT	Aralam T Vs Pulpally T
P Value	0.00	0.00	0.29	0.57
F value	200.4	350.6	1.13	0.45
Mean± SD	(7.70±2.41), (3.87±2.28)	(7.98±2.15), (3.37±1.81)	(7.70±2.41), (7.98±2.15)	(3.87±2.28), (3.69±1.81)
Pooled SD	2.35	1.99	2.28	2.06

NT- Non-Tribal girls, T-Tribal girls

Table 40 declared that there was a significant difference with p value 0.00 (significant at one percent level) in the nutritional knowledge level of the tribal and nontribal girls from the same locale whereas there was no significant differences in the nutritional knowledge level between both nontribal girls as well as between the both tribal girls (Fig 3).

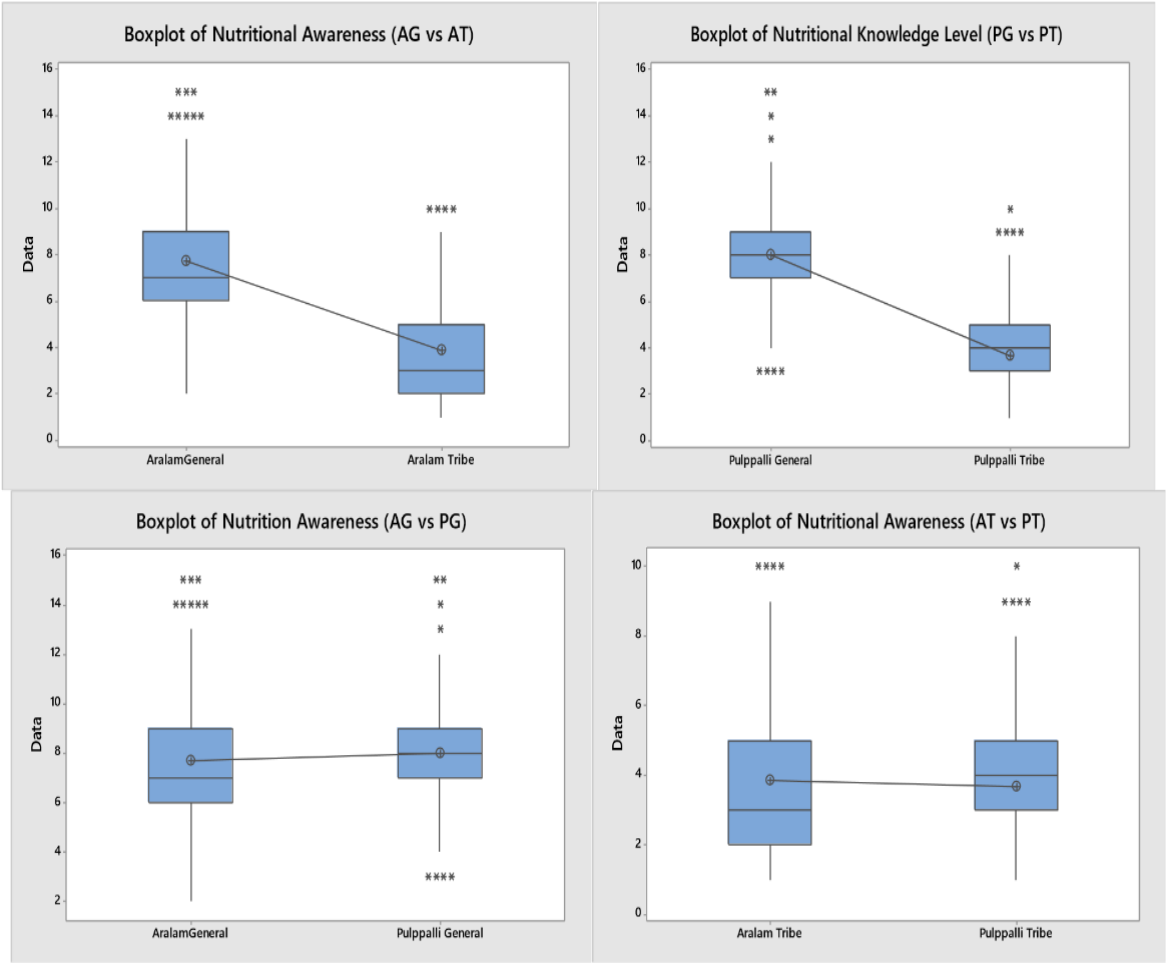

Figure. 3

c. Evaluation of reproductive health awareness among the selected girls

Menstrual hygiene and personal hygiene practices had a great influence on the reproductive health status of the young girls. From this study, it was noticed that, both tribal and nontribal girls had poor awareness level related to menstruation and menstrual hygiene practices. Table 41 emphasized the menstrual hygiene knowledge among the selected tribal and nontribal girls.

Table 41: Mean scores secured for reproductive health awareness by the selected girls

Variable Contents	Total Score	Mean score attained			
		Aralam (NT)	Aralam (T)	Pulpally (NT)	Pulpally (T)
Knowledge on menstruation	6	1.39±0.68	1.23±0.56	1.39±0.68	1.13±0.78
Knowledge on menstrual absorbent	8	2.04±1.46	1.32±0.08	2.04±1.28	1.24±0.51
Knowledge on hygiene	6	1.44±1.34	1.08±0.35	2.01±1.34	1.02±0.59

practices					
Knowledge on sexually transmitted diseases	5	1.05±0.38	0.98±0.63	1.65±0.38	0.88±0.48
Total	**25**	**5.92±3.83**	**4.61±2.22**	**6.51±3.68**	**4.27±2.36**

NT- Non-Tribal girls, T-Tribal girls

Table 41 discussed the knowledge on menstrual hygiene in to four different variables namely, knowledge on menstruation, menstrual absorbent, hygiene practices, and sexually transmitted diseases. The collected data exposed that nontribal girls from the Pulpally area attained the mean score of 6.51 (with the standard deviation of 3.68) than Aralam nontribal girls secured the mean score of 5.92 (with standard deviation of 3.83). Pulpally tribal girls scored the mean score of 4.72 (with standard deviation of 2.36) and Aralam tribal girls secured the mean score of 4.61 (with standard deviation 2.22).

Table 42: Reproductive and menstrual health awareness among the selected girls

Menstrual hygiene awareness	**Aralam (N=300)**				**Pulpally (N=300)**			
	NT (n=150)	**%**	**T (n=150)**	**%**	**NT (n=150)**	**%**	**T (n=150)**	**%**
21-25 (Excellent)	-	-	-	-	-	-	-	-
16-20 (Very good)	-	-	-	-	-	-	-	-
11-15 (Good)	21	14	0	5	21	14	-	-
6-10 (fair)	31	21	33	22	43	29	41	27
1-5 (Poor)	98	65	117	73	86	57	107	73

NT- Non-Tribal girls, T-Tribal girls

Table 42 pointed out that, knowledge level of the selected tribal girls were categorized according to their total score secured. It was noted that none of the tribal or nontribal tribal girls got excellent or very good scores. Fourteen percent of the nontribal tribal girls from both area acquired score ranged 11 to 15. Most of the tribal subject (73 percent) and nontribal tribal girls (65 and 57) respectively from Aralam and Pulpally area were poor in their menstrual hygiene and secured poor score in the range of 1-5.

Hypothesis H0.2: There is no significant difference between the reproductive health awareness of the tribal and nontribal girls from the same locale

Alternative hypothesis H1.2: There is a significant difference between the reproductive health awareness of the tribal and nontribal girls from the same locale

There was one null hypothesis (Hypothesis H0.2) and an alternative hypothesis framed before the study to assess the reproductive health awareness level between the tribal and nontribal girls. To analyze this hypothesis, the investigator tested one-way ANOVA between these two hypotheses. Table 43 enlightened about the variances.

Table 43: One-way ANOVA for evaluating differences in reproductive health awareness level of the selected girls

Nutritional Awareness	Aralam (NT Vs T)	Pulpally (NT Vs T)	Aralam NT Vs Pulpally NT	Aralam T Vs Pulpally T
F. Value	19.93	22.69	1.83	3.57
P. value	0.00	0.00	0.18	0.06
Mean± SD	(5.92±3.83), (4.30±2.22)	(6.51±3.68), (4.81±2.36)	(5.75±3.64), (6.50±3.68)	(4.31±2.22), (4.81±2.36)
Pooled SD	3.13	3.09	3.75	2.29

NT- Non-Tribal girls, T-Tribal girls

Table 43 declared that there was a significant differences with a P-value 0.00 (significant at one percent level) in the menstrual hygiene awareness level of the tribal and nontribal girls from the same locale whereas there was no significant differences in the reproductive health knowledge level between both nontribal girls as well as between the both tribal girls (Figure 4).

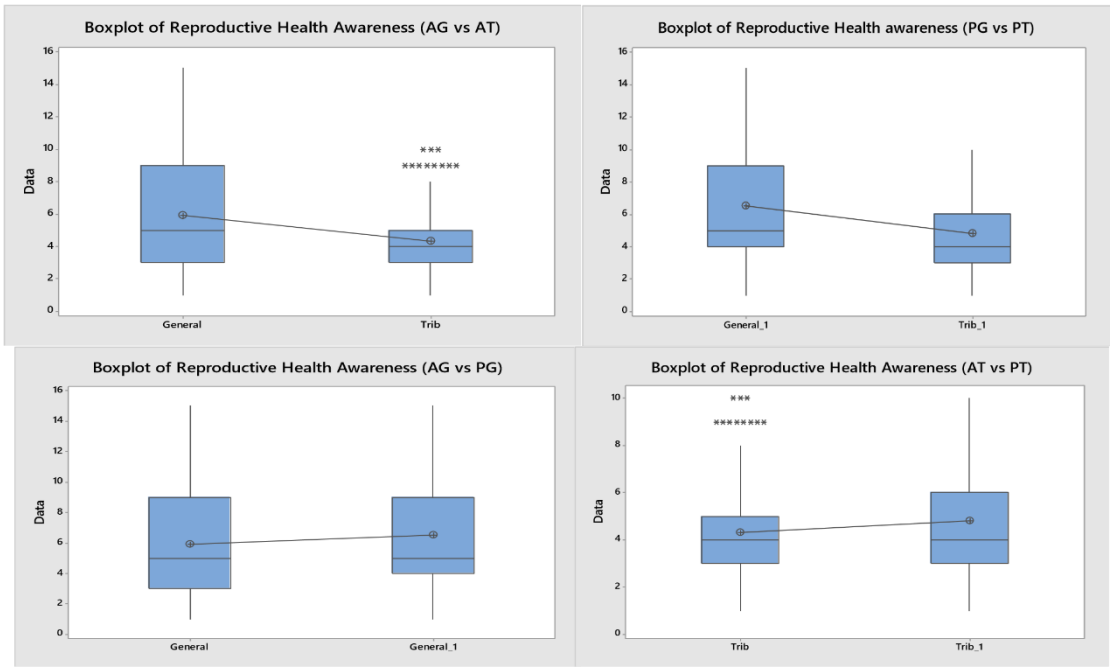

Figure. 4

D: Selection of tribal girls for intervention

It was observed from the first phase of the study that, around 60 percent of the tribal girls were suffered from clinical signs of anemia. From these selected tribal girls, 50 tribal girls were selected as experimental group after conferred their willingness. Only 10 to 15 tribal girls from the Aralam and Pulpally agreed to be the control group. Conducted clinical examination again in both area to acquire the control group in this study. Total 200 tribal girls were selected through screening for the further study. Cent percent of the control and experimental group of tribal girls agonized from paleness (Nail, conjunctiva, lip and tongue), fatigue and malaise. Detailed discussion is given in Table 68.

E: Raising nutrition garden at home level and collection of data related to wild edible flora and analysis of the nutrient content

a. Raising nutrition garden

Vegetables are the vital constituents of a balanced diet and kitchen garden act as the sustainable nutritional source for human population which provides enough nutrients like vitamins and minerals to attain the nutritional security for healthy life. Kitchen garden is an important component of the family's own determinations to supplement their food. There are rare vegetable producers among tribal communities because they did not have a habit of kitchen gardening near to their home. The house of the tribal communities were near to the forest and some vegetables were attracted the wild animals into their courtyards. Although electric fences have been installed around their homes, to protect themselves from the wild animals. Even though the implementation of nutrition garden among the tribal families were the real challenge for the investigator. Initially the families of the selected tribal girls refused to collect vegetables seeds and seedlings from the investigator and not willing to establish Kitchen garden in their area. After having several interactions with the selected families, nutrition garden was implemented and evaluated.

Seeds, seedling and cuttings were distributed among the experimental groups of tribal girls from both Aralam (n=50) and Pulpally (n=50) area. Trees like Papaya, Drumstick, and Curry leaves and shrubs included Chekurmanis, Brinjal, Ladies finger, Tomato, Red amaranth, Green amaranth, and Pea (Bush Type) and creepers included Bitter gourd, Snake gourd, Small gourd/Ivy, Cucumber, Pumpkin, Pea (creepy variety) and Ash gourd were provided to the families of the selected tribal girls. Table 44 points out the commonly used different type of the plants and their common and botanical names.

Table 44: Plants selected for cultivation in the nutrition garden

Type of the plants	Common Name	Botanical name
Trees		
Papaya	Kappakka	*Carica papaya*
Drumstick	Muringa	*Moringa oleifera*
Curry leaves	Curryveppu	*Murraya koenigii*
Shrubs		
Chekurmanis	Veelicheera	*Sauropus androgynus*
Brinjal	vazhuthana	*Solanum melongena*
Ladies finger	Venda	*Abelmoschus esculentus*
Tomato	Thakkali	*Solanum lycopersicum*
Red amaranth	Chemcheera	*Amaranthus cruentus*
Green amaranth	Pachacheera	*Amaranthus viridis*
Pea (Bush Type)	Kuttipayar	*Vigna unguiculata*
Creepers		
Bitter gourd	Paval	*Momordica charantia*
Snake gourd	Padavalam	*Trichosanthes cucumerina*
Small gourd/Ivy	Kovaikka	*Coccinia grandis*
Cucumber	Vellari	*Cucumis sativus*
Pumpkin	Mathan	*Cucurbita*
Pea (creepy variety)	Vallipayar	*V. unguiculata*
Ash gourd	Kumbalanga	*Benincasa hispida*

The above mentioned different types of vegetables fruits and leaves were daily used by the entire study groups during the study period.

b. Collection of data related to wild edible flora and fauna

Hundreds of species are abandoned or left unattended in the hands of various human societies. Most of the comestible vegetable diversities are significant in nutritional care. Similarly, known crops and many edible species from forests are not recognized even though they play a vital role in the food security of the tribal and rural families. For example, the wildlife of Dioscoria, Colocasia, and Amaranthus, which are rich sources of vitamins and nutrients, is catering to the food needs of many poor families living near the forest (Ramanadthan, 2012).

The investigator visited the tribal settlements and collected the data related to wild edible flora and fauna. All the tribal girls were from forest area and they collected large varieties of wild edible food items from the forest without knowing the nutritional significance and health benefits. The investigator gathered data in terms of common name, botanical name, number of families used for their consumption were listed in Table 45.

Table 45: Details regards the wild edible flora consumed by selected tribal families

Common Name	Botanical name	Found in	Number of families used			
			Aralam (n=150)		Pulpally (n=150)	
			No	%	No	%
Appuppanthadichappu			43	29	98	65
Chembumthal	*Colacasia esculenta*	River sides, wet lands	150	100	150	100
Chemcheera	*Amaranthus cruentus*	Forest wet land, dry land	150	100	150	100
Chenathandu	*Amorphophallus paeoniifolius*	Dry and medium wet land	150	100	150	100
Chundakka	*Solanum violaceum Ortega*	Wet and dry land	150	100	150	100
Illikumb	*Bambusa bambos*	Dry and medium wet land	150	100	150	100
Kaakkachappu	*Solanum nigrum*	Dry and wet land	98	65	138	92
Kaattucheera	*Amaranthus spinosus*	Wet or dry land	87	58	121	81
Kanthaarichappu	*Capsicum annuum*	Forest, paddy field	95	63	134	89
Kappachappu	*Manihot esculenta*	Tapioca field	64	43	112	75
Karimthal	*Colacasia esculenta black*	River side, wet or dry land	58	39	135	90
Kattupayar	*Vigna radiata (L.) Wilczek var. radiata*	Dry and medium wet land	112	75	127	85
Kodavan	*Centella asiatica*	Wet or dry land, paddy field	68	45	143	95
Kovalchappu	*Coccinia*	Wet or dry land	97	65	128	85
Kumbalachappu	*Benincasa hispida*	Wet or dry land	45	30	79	53
Kuppacheera	*Pouzolzia zeylancia*	Dry and wet land	59	39	121	81
Mashithandu	*Peperomia Pellucida*	Wet land	13	9	67	45
Mathachappu	*Cucurbita*	Paddy field, wet or dry land	146	97	150	100
Murikkuchappu	*Erythrina*	Dry land	16	11	54	36
Muringachappu	*Moringa olefera*	Dry and medium wetland	150	100	150	100
Pachacheera	*Amaranthus viridis*	Wet or dry land	150	100	150	100
Churulichappu	*Diplazium esculentum*	River side, wet land of forest	39	26	141	94
Punnarathakara	*Cassia tora*	Wet or dry land	97	65	148	99

Common Name	Botanical name	Found in	Number of families used			
			Aralam (n=150)		Pulpally (n=150)	
			No	%	No	%
Thakkalichappu	*Solanum lycopersicum*	Wet or dry land	98	65	139	93
Thazhuthama	*Boerhaavia diffusa*	Wet or dry land	127	85	146	97
Thumbachappu	*Leucas aspera*	River side, paddy field, wet lands	67	45	139	93
Vallikurumthotty	*Sida cordata*	Dry and medium wet land	19	13	117	78
Vattathakara	*Senna tora*	Wet or dry land	67	45	134	89
Vayalchulli	*Hygrophila auriculata*	Wet land	13	9	132	88
Veelicheera	*Sauropus androgynus*	Wet or dry land	134	89	150	100
Chenathandu	*Amorphophallus paeoniifolius*	Dry and medium wet land	150	100	150	100

Many tribal and nontribal households in Kannur and Wayanad district of Kerala conserved a great acquaintance about the various floral and faunal species for their existence needs. Table 45 highlighted about the wild edible plants which were generally used in their daily diet. The tribals observed the herbivores and established acquaintance related to different types of edible flora in ancient time and then the knowledge handover through generations. Nearly 50 edible flora from both area were collected and 31 were listed were commonly consumed by the study groups. Table 45 exhibited that edible floras like Chembumthal, Chemcheera, Chenathandu, Chundakka, Illikumb, Pachacheera and Chenathandu were consumed by cent percent of tribal families of the selected tribal girls.

Table 46: Wild edible Mushrooms consumed by tribal families

Common Name	Botanical name	Found in	Seasonal availability	Number of families used			
				Aralam (n=150)		Pulpally (n=150)	
				No	%	No	%
Arikoon	*Termitomyces*	Wet land	May-October	150	100	150	100

Chempoopal	*Laccaria laccata*	Wet and dry land	January-December	34	23	94	63
Chippikoon	*Hohenbuehelia*	Old wood roots, died roots	September-November, Monsoon	67	45	142	95
Kachikoon	*Lentinus squarrosulus*	Hay, decayed timber	January – December	120	80	149	99
Kappapoopal	*Pleurotus*	Tapioca stem, wood trunk	January-December	21	14	137	91
Marapoopal	*Schizophyllum*	Tree trunks	February, June-August, October-November	37	25	98	65
Paavakoon	*Calocybe*	Wet Land	May-October	150	100	150	100
Perumkoon	*Agaricus*	Wet land	North-east monsoon	150	100	150	100

All the selected tribals gathered different kinds of mushrooms from different part of the forest in different seasons. Mushrooms have their own season to bloom and decay and some mushrooms are non-edible and toxic in nature. All the tribals had enough knowledge to differentiate the edible one from toxic mushrooms. Tribal called mushrooms were 'Pooppal'. There were different kinds of Pooppal known to the tribal groups. Table 46 comprehensive about the different fungal groups which were common among the selected study area. The mushrooms courteously grow in the fertilized land of the forest, decayed wood drunks, roots, live trees, dried leafs and so on. The spores remained in the same spot of the collected Pooppal and tribals noticed those space for the next occasion. Table 46 revealed that, mushrooms like Arikoon, Paavakoon, and Perumkoon were consumed by cent percent of the tribal tribal girls from both the study areas.

Table 47: Fruits, nuts and seeds consumed by the selected tribal tribal girls

Common Name	Botanical Name	Common Name	Botanical Name
Aathakka	*Annona reticulata*	Mullaatha	*Annona muricata*
Ayanimaram/Anjili/Aanikka	*Artocarpus hirsutus*	Naaranga	*Citrus limon*
Guava	*Psidium guajava*	Nelli	*Phyllanthus emblica*
Kaattathi	*ficus carica*	Njarakka	*Syzygium cumini L.*
Kaattukarimbu	*Saccharum spontaneum L*	Parankimav	*Anacardium occidentale*

Kaattunaaranga	*Citrus hystrix*	Passionfruit	*Passiflora ligularis*
Kadumpulinaranga	*Citrus aurantiifolia*	Passionfruit	*Passiflora edulis*
Kakkumkay	*Entada rheedei*	Plav/Pilav	*Atocarpus heterophyllus*
Kamblinaaranga	*Citrus maxima*	Thannikka	*Terminalia bellirica Roxb.*
Kurukapazham	*Passiflora foetida*	Thondikka	*Sterculla guttatta DC*
Mavu	*Mangifera india*		

Table 47 depicted the variety of fruits and seeds found in the forest used by the tribal families. Most of these predisposed by the climate. Even then some of the fruits which were remained for the next seasons. It was observed that, all the families of selected tribal girls gathered and consumed these fruits in their daily dietaries. Edible roots and tubers included in the diet of tribal tribal girls were pointed out in Table 48.

Table 48: Edible roots and tubers consumed by tribal families

Common Name	Botanical Name	Number of families used			
		Aralam (n=150)		Pulpally (n=150)	
		No	%	No	%
Chathavali	*Asparagus raccemosus*	57	38	127	85
Chanakoova	*Costus speciosus*	61	41	117	78
Manjakoova	*Curcuma neilgherrensis*	21	14	96	64
Kallanmula	*Dendrocalamus strictus Nees*	41	27	119	79
Kattukachil	*Discorea bulbifera*	110	73	143	95
Koorkka	*Plectranthus rotundifolius*	150	100	150	100
Chava kizhangu	*Discorea hispida*	62	41	134	89
Chembu	*Colacasia esculenta*	150	100	150	100
Kallu vazha	*Ensete superbum*	64	43	137	91
Vennikilangu/ bennikikalasu	*Dioscorea hamiltonii*	98	65	139	93
Kavalakilangu	*Dioscorea oppositifolia*	87	58	116	77
Noorakilangu/ nallanoora	*Dioscorea pentaphylla*	91	61	143	95
Narakilangu	*Dioscorea wallichii*	63	42	140	93
Vella kachil/ neelakachil	*Dioscorea alata*	150	100	150	100
Cheana	*Amorphophallus paeoniifolius*	150	100	150	100

The tubers collected by the tribals were Dioscorea species which are highly nutritious as well as delicious to consume (Swaminathan Research Foundation, 2016) and the tubers grew in the forest. Tribals never discard the tree in the first harvest, instead they preserve the roots and planted it again in the same place for next harvest. By this way these people never demolished the forest foods, besides they conserved for the next generations. They consider the forest as their own cultivation lands. Roots and tubers like Koorkka, Chembu, Vella

kachil/ neelakachil, and Cheana were consumed by cent percent of the tribals. Table 49 pointed out fish and mussels gathered by the tribal families.

Table 49: Fishes and mussels consumed by tribal families

Common Name	Scientific Name	Common Name	Scientific Name
Catla	*Catla catla*	Kodalimeen	*Garra mullya*
Chemballi	*Lebeo rohita*	Kuruvameen	*Puntius poovarensis*
Crab	*Brachyuran*	Malanjil	*Anguilla begalensis*
Cheerumeen	*Channa marulius*	Mathiparal/ chalaparal	*Salmo trutta fario L.*
Kadu/kodu	*Glyptothorax housei Herre*	Mushi/ Muzhi	*Clarias dayi Hora*
Kakka	*Parreysia corrugata*	Mystus montanus	*Puzha mullan*
Kakka	*Pomacea maculata*	Njavanikka/ Noonji	*Lymnaea stagnalis/*
Kallanphilopia/ Thilopia	*Peristolepis marginata*	Paral	*Barillius canarensis*
Kallelkeri	*Garra hughi*	Paral	*Barillius gatensis*
Kallemutty/ kallelotti	*Balitora brucei*	Philopia / Thilopia	*Oreochromis mossambica Peters*
Kannadi	*Ompok bimaculatus Bloch*	Rohu	*Labeo calbasu*
Kari	*Ompok malabaricus valenciennes*	Varal/moie	*Channa orientalis*
Kattimeen	*Tor mussallah*	Vellie meen	*Cyprinus carpio communis*
Kola	*Xenentodon cancila*		

Rivers in Kerala is a permeated place for the fish resource and the tribals were the efficient captures. They had their own way to catch fishes other than net methods. Tribals rarely used the ‘Thotta’ (kind of blaster used by other people to catch fish). They commonly used rods named ‘Choonda’, and trappers made by cane rods or coconut sticks named ‘Kotta’. They used sharpened long cane rods called ‘vadi’, and by hand itself etc. for hunting fish and crabs. It was noticed that all of the tribals consumed varieties of fish in the daily dietary based on the availability. Poultry products included in the diet and given in Table 50.

Table 50: Poultry foods consumed by selected tribal families

Common Name	Scientific Name	Number of families used			
		Aralam (n=150)		Pulpally (n=150)	
		No	%	No	%
Kaaka	*Corvus macrorhynchos*	64	43	134	89
Kaattukozhi	*Porphyrio porphyrio*	150	100	150	100

Kulakozhi	*Gallicrex cinerea*	150	100	150	100
Malamuzhakki	*Anthracoceros coronatus*	46	31	138	92
Mayil	*Pavo criststus*	12	8	51	34
Pazhavawal	*Rousettus leschenaultii*	24	16	43	29
Prav	*Columba livia*	112	75	145	97
Pullimoonga	*Athene brama*	37	25	69	46
Vellachiikok	*Bubulcus*	84	56	113	75

Table 50 explained about the poultry which they included as the part of their diet. The tribals did not have the habit of rearing animal or poultry farming in their home. Even though very few had such practices they did it for marketing to increase their family income. Cent percent of the selected tribal girls consumed Kattukozhi and Kulakozhi as the part of their food.

Table 51: Animals consumed by tribal families

Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Karingurangu	*Trachypithecus johnii*	Mullan panni	*Hystrix indica*
Kattupanni	*Sus scrofa*	Muyal	*Lepus nigricollis*
Kattupoth	*Bos frontalis*	Pachathavala	*Euphlyctis cyanophlyctis*
Kattuvarayannan	*Funambulus tristriatus*	Perumchazhi	*Bandicota bengalensis*
Kezhaman	*Muntiacus muntjack*	Thavala	*Hoplobatrachus crassus*
Kuttithevangu	*Loris tardigradus*	Udumbu	*Varanus bengalensis*
Maan	*Axis axis*	Urumbutheeni	*Manis crassicaudata*
Malayannan	*Ratufa indica*	Varayannan	*Funambulus layardi*
Mlavu	*Cervus unicolor*		

Even though there were so many laws restricted to hunting in forest, cent percent of tribal girls liked to consume the non-vegetarian foods and are described in the above Table 51. These animal specious regularly included in the diet of the selected tribal girls.

c. Estimation of nutrient content of the selected wild edible flora

Even though there were lots of edible flora which consumed by the selected tribal tribal girls, investigator selected eight flora which were easily available and regularly consumed by the selected tribal girls whereas the nontribal families were considered these plants as weeds and destroyed from the fields and courtyards.

Table 52: Frequency of commonly consumed plant foods

Common Name	Botanical Name	Frequency of consumption*(n=300) in percent			
		Four times in a week	Twice in a week	Weekly once	Rarely
Wayalchulli	*Hygrophila auriculata*	18	16	26	40
Vatta thakara	*Cassia tora*	10	15	37	38
Aalachappu	*Crassocephalum crepidioides*	15	22	21	42
Kaashithumba	*Leucas zeylanica*	18	18	27	36
Punnara Thakara	*Senna tora*	14	24	14	48
Churuli chappu	*Diplazium esculentum*	12	17	32	59
Kaattucheera	*Alternanthera brasiliana*	22	14	22	42
Kodakan	*Centella asiatica*	18	15	29	38

Selected plant samples were collected from the study areas and were *Hygrophila auriculata* (Vayal Chulli), *Diplazium esculentum* (Churuli Chappu), *Centella asiatica* (Kodakan), *Senna tora* (Punnara thakara), *Alternanthera brasiliana* (kaattu Cheera), *Leucas zeylanica* (Kaashi Thumba), *Cassia tora* (Vattathakara), and *Crassocephalum crepidioides* (Aalachappu) and these plants used for phytochemical analysis and estimation the mineral content using FESEM analysis.

1. Phytochemical analysis of the wild edible flora

The plant samples were collected from the forest of the selected tribal area and gently washed in double distilled water and set aside for free from water particle. Allowed the leaves for shade drying and spread the leaves in every second hour to keep the plat dry evenly. Allowed these leaves in a clean place for eight days and stored in a sealed cover safely for further analysis of phytochemicals.

Table 53-a: Phytochemical analysis of the selected wild edible flora

Phytochemicals	Samples name and extract							
	Kaattucheera		Aalachappu		Churulichappu		Punnarathakara	
	Water	Ethanol	Water	Ethanol	Water	Ethanol	Water	Ethanol
Alkaloids	++	+	++	-	++	+	++	-
Terpenoids	++	++	+	++	-	++	++	-
Phenols	+	++	++	++	-	++	++	+
Sugar	-	-	-	-	-	-	-	-
Saponin	-	-	+	-	+	+	+	-
Flavonoids	++	++	-	-	-	-	-	-
Quinines	++	++	+	++	-	-	-	+
Sterols	-	-	+	-	-	+	-	-

++ indicated the thick precipitation, + indicated the mild precipitation

Table 53 -b: Phytochemical analysis of the selected wild edible flora

Phytochemicals	Samples name and extract							
	Vattathakara		Vayalchulli		Kodakan		Thumba	
	Water	Ethanol	Water	Ethanol	Water	Ethanol	Water	Ethanol
Alkaloids	+	-	+	++	++	-	++	-
Terpenoids	-	++	+	-	+	++	-	+
Phenols	+	++	++	+	+	++	++	+
Sugar	-	-	-	-	-	-	-	-
Saponin	+	+	+	-	+	-	+	-
Flavonoids	-	-	-	-	-	-	+	-
Quinines	-	++	-	++	++	+	++	+
Sterols	-	-	+	++	-	-	-	+

++ indicated the thick precipitation, + indicated the mild precipitation

Table 53 (a) and (b) indicated the phytonutrient constituents of selected plants available and commonly consumed by the tribal families. Aqua and ethanol medium were selected to extract of each plant samples. Alkaloids, terpenoids, phenols, quinines, and so on were presented in all the selected plant samples whereas in water extracts there was a better precipitate. None of the selected plant sample contained sugar content and very few plant samples, including Kattucheera and Thumba contained flavonoids and sterols.

Taste of Saponins is little bitter and was characterized by hemolytic, Red Blood Cells precursor, binding cholesterol, and form formation (Andallu and Sathya, 2014). High amount of Saponins is known to toxic effect in cattles (Milgate and Roberts, 1995). Nevertheless,

they were constructive in pharmacological aspects, comprising anti-viral, anti-parasitic, and anti-inflammatory properties. Due to its association with cholesterol and sex hormones, sterols in plants have significant pharmacological value, as these compounds act as a precursor to the synthesis of hormones (Andallu and Sathya, 2014). Phenolic compounds have many biological roles in human health, from protection against apoptosis, rapid aging, cardiovascular disease, inflammation, atherosclerosis, and angiogenesis (Yadav, 2011). Tannins have cytotoxic, antimicrobial antioxidant, and activities (Thangapandian, 2010) in addition, they have the ability to obstruct HIV (Kim and Karadeniz, 2011). Some studies revealed that plant proteins have antimicrobial properties (Akinyele et al., 2017). Plants can defend themselves from certain microbial pathogens by producing numerous antimicrobial proteins.

2. FESEM Analysis to find out the mineral content of selected plant samples

Based on the presence of phytochemicals in the selected plants samples, further analysis in FESEM was carried out. The following pages indicated the topography, morphology, and the elemental distribution with its percentage of the selected plant samples gathered from the study areas.

Sample 1. Kodakan (*Centella asiatica*): Quantitative compositional information using Energy Dispersive Spectroscopy (EDS)

Table 54: Elemental distribution of *Centella asiatica.*

Element	Weight (%)	Atomic (%)	Error (%)
Carbon	33.94	44.82	7.83
Oxygen	43.44	43.06	9.65
Sodium	8.06	5.56	8.39
Magnesium	2.65	1.73	8.35
Chlorine	1.53	0.69	5.50
Potassium	2.98	1.21	4.36
Calcium	7.40	2.93	2.52

Sample 2. Wayalchulli (*Hygrophila auriculata*): Quantitative compositional information using Energy Dispersive Spectroscopy (EDS)

Table 55: Elemental distribution of *Hygrophila auriculata*

Element	Weight (%)	Atomic (%)	Error (%)
Carbon	26.14	36.22	6.97

Oxygen	50.08	52.09	9.27
Sodium	2.10	1.52	11.24
Magnesium	4.02	2.75	6.92
Potassium	9.58	4.08	3.30
Calcium	8.07	3.35	4.08

Sample 3. Vattathakara (*Senna tora*): Quantitative compositional information using Energy Dispersive Spectroscopy (EDS)

Table 56: Elemental distribution of *Senna tora*

Element	Weight (%)	Atomic (%)	Error (%)
Carbon	36.48	48.75	7.74
Oxygen	41.42	41.55	9.71
Magnesium	1,74	1.15	7.26
Phosphorus	1,26	0.65	4.95
Chlorine	3.50	1.58	3.86
Potassium	6.63	2.72	3.48
Calcium	8.96	3.59	3.22

Sample 4. Churulichappu (*Diplazium esculentum*): Quantitative compositional information using Energy Dispersive Spectroscopy (EDS)

Table 57: Elemental distribution of *Diplazium esculentum*

Element	Weight (%)	Atomic (%)	Error (%)
Carbon	34,78	45.99	7.89
Oxygen	44.00	43.69	8.94
Sodium	2.43	1.68	9.06
Magnesium	2.05	1.34	7.14
Aluminium	4.73	2.78	4.91
Chlorine	1.66	0.74	6.72
Potassium	3.73	1.52	4.51
Calcium	3.35	1.33	5.17
Iron	3.28	0.93	8.09

Sample 5. Aalachappu (*Crassocephalum crepidioides*): Quantitative compositional information using Energy Dispersive Spectroscopy (EDS)

Table 58: Elemental distribution of *Crassocephalum crepidioides*

Element	Weight (%)	Atomic (%)	Error (%)
Carbon	36.78	51.82	8.82
Oxygen	29.35	31.04	9.96

Sodium	5.13	3.78	7.36
Magnesium	1.61	1.12	7.25
Aluminium	1.59	1.00	5.11
Sulphur	0.84	0.44	9.06
Chlorine	6.76	3.23	2.82
Potassium	12.35	5.35	2.81
Calcium	4.45	1.88	5.01
Iron	1.14	0.35	15.98

Sample 6. Kaattucheera (*Alternanthera brasiliana*): Quantitative compositional information using Energy Dispersive Spectroscopy (EDS)

Table 59: Elemental distribution of *Alternanthera brasiliana*

Element	Weight (%)	Atomic (%)	Error (%)
Carbon	33.07	43.40	7.13
Oxygen	47.74	47.05	9.73
Sodium	4.98	3.42	9.83
Magnesium	2.14	1.39	8.94
Potassium	7.85	3.17	2.70
Calcium	3.51	1.38	5.00
Iron	0.71	0.20	17.45

Sample 7. Kashithumba (*Leucas zeylanica*): Quantitative compositional information using Energy Dispersive Spectroscopy (EDS)

Table 60: Elemental distribution of *Leucas zeylanica*

Element	Weight (%)	Atomic (%)	Error (%)
Carbon	41.25	51.44	6.58
Oxygen	45.98	43.05	9.32
Sodium	1.21	0.79	11.58
Magnesium	0.79	0.49	9.54
Phosphorus	0.69	0.33	7.55
Sulphur	0.68	0.32	11.38
Chlorine	0.70	0.30	12.82
Potassium	4.24	1.62	4.53
Calcium	4.45	1.66	4.88

Sample 8: Punnarathakara (*Cassia tora*): Quantitative compositional information using Energy Dispersive Spectroscopy (EDS)

Table 61: Elemental distribution of *Cassia tora*

Element	Weight (%)	Atomic (%)	Error (%)
Carbon	55.98	64.51	5.20

Oxygen	39.48	34.15	8.95
Magnesium	0.91	0.52	15.91
Aluminium	0.70	0.36	21.48
Silicon	0.62	0.31	22.96
Gold	2.31	0.16	31.93

From the Table 54 to 61 declared that the wild edible plants collected from the selected areas were rich in mineral content such as, Sodium, Magnesium, Aluminum, Sulphur, Chlorine, Potassium, Calcium, Iron, and Gold which have effective role in the growth and development of the young girls. None of the tribal families were aware of the nutritional importance and health benefits of these plants which available at their door steps.

F: Effect of nutrition interventions on dietary pattern and nutritional and health status of the selected tribal girls

Effect of nutrition interventions of nutrition education for the period of one year and promotion of nutrition garden was evaluated in terms of dietary pattern and nutritional health status of the selected tribal girls.

H0.3. Nutritional intervention program do not produce any significant effect on the dietary intake of selected tribal girls.

H1.3. Nutritional intervention program produce significant impact on the dietary intake of selected tribal girls.

One null hypothesis and one alternative hypothesis was constructed prior to the study to evaluate the effect of interventions on the dietary intake of the selected tribal girls. ANOVA was tested among the variables in to find out the significant effect on their dietary intake. Results were explained in the following tables.

a. Dietary Intake

1. Dietary pattern of the selected tribal girls

Growth during childhood and adolescence is faster than at any other time in an individual's life except the first year. Good nutrition during childhood and adolescence is critical to cover the deficits suffered during childhood and should include nutrients required to meet the demands of physical and cognitive growth and development. The dietary pattern of the selected tribal girls was vary according to their unawareness. They considered the side

dish just to consume the main course. They were not aware of the nutritional importance of the green leafy vegetables, pulses, or any of the food stuff they consumed. Table 62.a and 62.b explained about the dietary pattern of the selected tribal girls before and after the study period of one year.

Table 62. a and 62. b explained about the dietary pattern of the selected tribal girls. Form this data it was very cleared that the dietary intervention programs had a positive influence on the dietary pattern of the experimental group of selected girls when compared with the control group from both Aralam and Pulpally area. They improved their awareness level and understood about the nutrient sources as well. After one year of the interventional programs, cent percent of the experimental girls from both study area started to consume cereals, green leafy vegetables and oils in their everyday diet. Eighty nine and 86 percent of the girls started to consume wild fruits every day. Fifty four percent of the experimental girls from Aralam area started to include pulses in their everyday diet. Fifty four and 59 percent of the experimental girls stared to include milk or milk product (mainly curd) in their daily menu. But the control group of girls did not show any improvement in their dietary pattern during the study period.

Table 62. a: Dietary pattern of the selected tribal girls (Aralam)

Food items	Aralam (Group I) %												Aralam (Group II)%											
	Before				After6Months				After 1 Year				Before				After6Months				After 1 Year			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Cereals	100	-	-	-	100	-	-	-	100	-	-	-	100	-	-	-	100	-	-	-	100	-	-	-
Pulses	-	-	23	77	-	-	23	77	-	-	23	77	-	-	28	72	12	54	22	12	54	31	15	-
GLV	2	19	69	10	2	19	69	10	2	19	69	10	6	17	52	25	72	28	-	-	100	-	-	-
OV	-	-	79	21	-	-	79	21	-	-	79	21	-	-	68	32	51	31	18	-	89	11	-	-
R & T	-	13	52	35	-	13	52	35	-	13	52	35	-	17	47	36	12	31	52	5	64	29	7	-
Oil/fat	16	29	37	18	16	27	38	19	14	29	37	20	19	32	37	12	71	26	3	-	100	-	-	-
Fruits	-	-	41	59	-	-	41	59	-	-	43	57	-	-	44	56	19	79	2	-	89	11	-	-
Egg	-	-	79	21	-	-	79	21	-	-	79	21	-	-	76	24	-	-	99	1	-	-	100	-
Milk and its products	-	8	12	80	-	10	11	79	-	8	12	80	-	6	13	81	13	68	19	-	54	45	1	-
Meats/ fish	-	16	79	5	-	16	79	5	-	16	79	5	-	14	5	81	-	49	51	-	-	53	47	-
Jaggery	-	-	-	100	-	-	-	100	-	-	-	100	-	-	-	100	27	34	39	-	65	35	-	-

Group I- Control group, Group II- Experiment group, A-Daily, B- 4 to 5 times (Weekly), C- 2 to 3 times (weekly), D- Rarely, GLV- Green Leafy Vegetables, OV- Other vegetables, R&T- Roots and Tubers

Table 62. b: Dietary pattern of the selected subjects (Pulpally)

Food items	Pulpally (Group I) %												Pulpally (Group II)%											
	Before				After6Months				After 1 Year				Before				After6Months				After 1 Year			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Cereals	100	-	-	-	100	-	-	-	100	-	-	-	100	-	-	-	100	-	-	-	100	-	-	-
Pulses	-	-	56	44	-	-	56	44	-	-	56	44	-	-	54	46	49	38	13	-	-	67	33	-
GLV	8	31	61	-	8	31	61	-	8	31	61	-	9	28	63	-	64	36	-	-	100	-	-	-
OV	-	4	34	62	-	4	34	62	-	4	34	62	-	5	51	44	69	31	-	-	87	13	-	-
R & T	-	19	37	44	-	20	37	43	-	19	37	44	-	18	39	43	19	74	7	-	39	54	7	-
Oil/fat	-	12	42	46	-	14	42	44	-	12	42	46	-	14	53	33	67	33	-	-	100	-	-	-
Fruits	-	13	21	66	-	13	21	66	-	13	21	66	-	19	18	63	54	43	3	-	86	14	-	-
Egg	-	-	62	38	-	-	61	39	-	-	62	38	-	-	59	41	-	-	89	11	-	-	100	-
Milk and its products	-	-	-	100	-	-	-	100	-	-	-	100	-	-	-	100	12	39	47	2	59	41	-	-
Meats/ fish	-	6	26	68	-	6	26	68	-	6	26	68	-	5	28	67	-	18	76	6	-	54	46	-
Jaggery	-	-	-	100	-	-	-	100	-	-	-	100	-	-	-	100	27	34	39	-	65	35	-	-

Group I- Control group, Group II- Experiment group, A-Daily, B- 4 to 5 times (Weekly), C- 2 to 3 times (weekly), D- Rarely, GLV- Green Leafy Vegetables, OV- Other vegetables, R&T- Roots and Tubers

2. Macro-nutrients intake

Table 63 highlighted the effect of nutrition intervention on the macronutrient consumption pattern of the selected tribal girls.

Table 63: Mean macronutrient intake of the selected tribal girls

	A.T(Group I) n=50			A.T(Group II) n=50			P.T(Group I) n=50			P.T(Group II) n=50		
	Before	After 6 Months	After 12 Months	Before	After 6 Months	After 12 Months	Before	After 6 Months	After 12 Months	Before	After 6 Months	After 12 Months
Energy Mean±SD	2049.56 ±279.85	2087.8± 256.68	2030.98± 267.81	2026.54± 165.24	2162.52± 149.67	2311.16 ±153.61	1718.88± 355.76	1676.30 ±269.59	1742.5± 307.71	1628.82 ±261.25	2220.54± 239.99	2416.84 ±409.11
Maximum	2799	2759	2869	2369	2459	2546	2651	2436	2563	2356	2987	3265
Minimum	1433	1539	1496	1537	1659	1703	1265	1268	1325	1265	1687	1496
F Value (P value)	0.59 (0.56)			32.96 (0.00)			0.57 (0.56)			86.08 (0.00)		
Protein Mean±SD	33.43± 10.08	33.99± 9.60	32.51± 9.41	33.24± 6.99	39.26± 6.43	45.51± 5.62	20.35± 4.35	19.91± 5.11	20.26± 4.92	22.69± 5.42	38.19± 7.60	48.26± 7.03
Maximum	57.24	55.46	54.02	51.29	55.29	56.49	30.23	34.60	34.60	36.40	50.24	62.00
Minimum	16.28	17.89	18.27	15.26	25.89	30.59	12.37	12.53	13.25	13.25	13.54	28.90
F Value (P value)	0.30 (0.743)			46.43 (0.000)			0.11 0.892			182.22 0.000		
Fat Mean±SD	29.96± 6.07	28.86± 5.94	28.80± 7.10	25.93± 4.69	30.5±4.90	35.8± 3.42	19.86± 4.56	19.91± 3.53	20.08± 3.49	19.03± 3.70	30.83± 5.32	42.78± 5.68
Maximum	45.26	46.23	50.26	34.29	39.8	44.21	35.80	26.59	29.40	27.80	39.80	56.00
Minimum	21.4	20.35	20.29	18.53	21.3	27.21	13.80	13.80	13.50	13.57	21.30	32.00
F Value (P value)	0.52 (0.59)			63.24 (0.000)			0.05 (0.96			285.03 (0.000)		

Group I- Control group, Group II- Experiment group, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months, ICMR RDA (2013)

In the beginning of the study, control groups of the tribal areas of Aralam and Pulpally had the mean of 2049.56 Kcal and 1718.88 Kcal of energy with a standard deviation of 279.85 and 355.76 respectively. After six months, attained mean score was 2087.8 Kcal with standard deviation of 256.68 and after one year attained mean energy was 2030.98 Kcal with standard deviation of 267.81. There was no significant differences (p value-0.56) in their energy intake whereas the experimental group had a mean of 2026.54 Kcal and 1628.82 Kcal in the beginning of the study with the standard deviation of 165.24 and 261.25 in Aralam and Pulpally respectively. After six months there was an improvement in their energy intake with mean 2162.52 Kcal and 2220.54 Kcal respectively with standard deviation 149.67 and 239.99. After one year, the selected tribal girls in the experimental groups reached the standard mark with mean score of 2311.16 Kcal and 2416.84 Kcal of the selected tribal girls in both Aralam and Pulpally respectively with the standard deviation of 409.11 and 153.61. The experimental group showed significant deviation at one percent level. Graph (Fig.5) showed the gradual improvement of the energy consumption of the selected tribal girls.

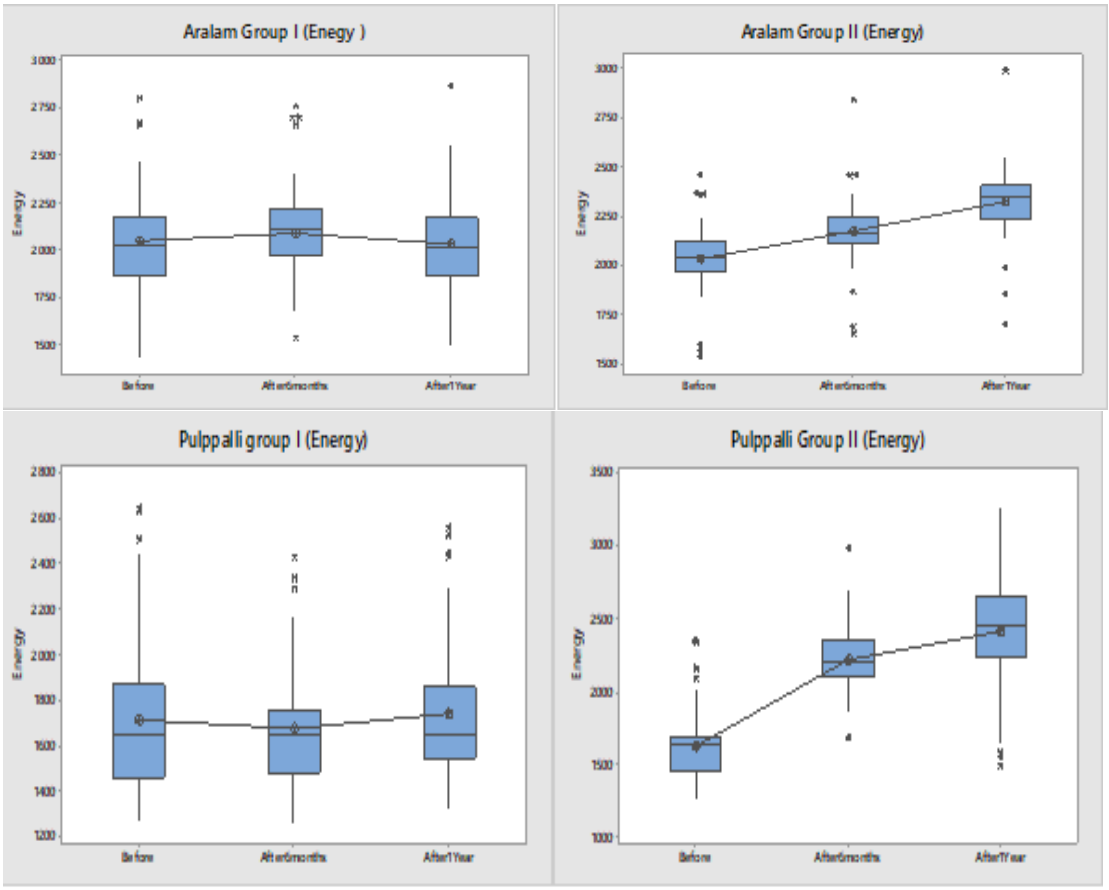

Figure. 5

Protein intake of the selected tribal girls were described in Table 63. The selected tribal girls in experimental group had improved their protein consumption of 33.24 g and 22.69 g, from both the study areas of Aralam and Pulpally respectively with the standard deviation of 6.99 and 5.42 respectively to 39.26 g and 38.19 g with a standard deviation of 6.43 and 7.60 after the period of six months of the study and then their protein consumption was enhanced to 45.51g and 48.26 g after one year with a standard deviation of 5.62 and 7.03 respectively and showed significant improvement at one percent level (Fig.6)

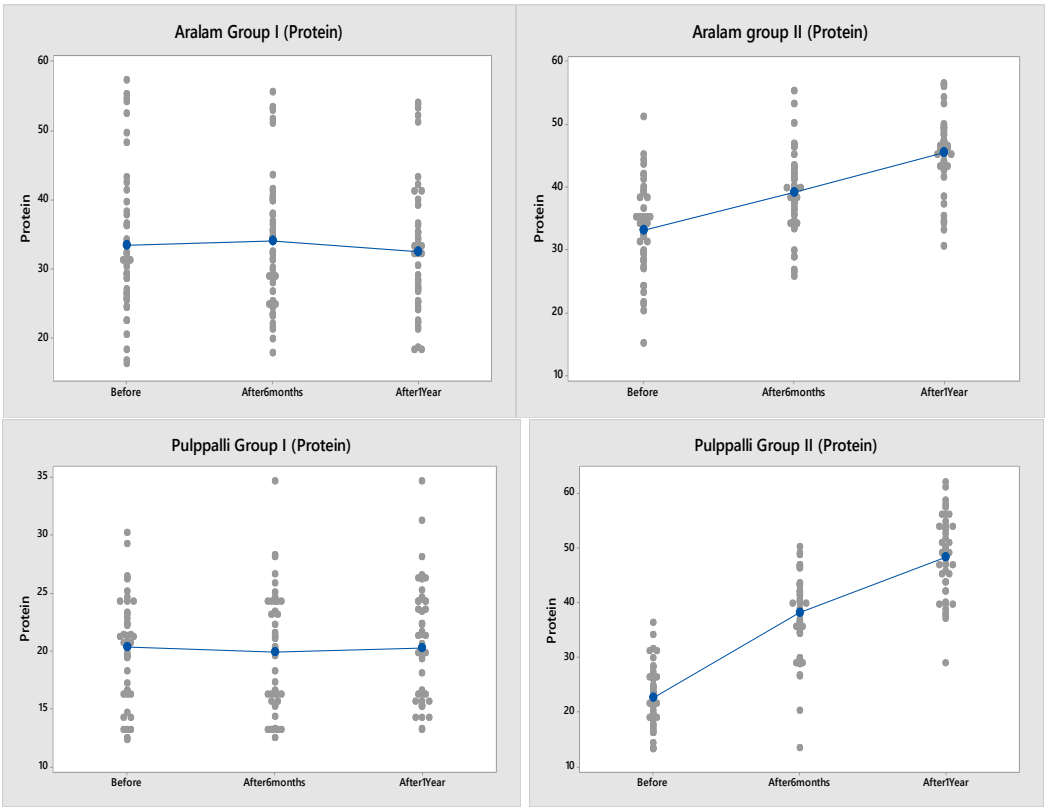

Figure: 6

Results of the study showed that fat intake of the selected tribal girls experimental group was 25.93 g and 19.03 g in the initial stage of the study with the standard deviation of 4.69 and 3.70 among Aralam and Pulpally respectively. After six months, there was a gradual improvement in their fat consumption by 30.5 g and 30.83 g with the standard deviation of 4.90 and5.32 and after one year, required fat consumption was noted with the mean intake of 35.8 g and 42.78 g with the standard deviation of 3.42 and 5.68 respectively. In experimental group, a significant difference at one percent level has noted (Fig 7). Control group did not show any significant difference after the study period of one year.

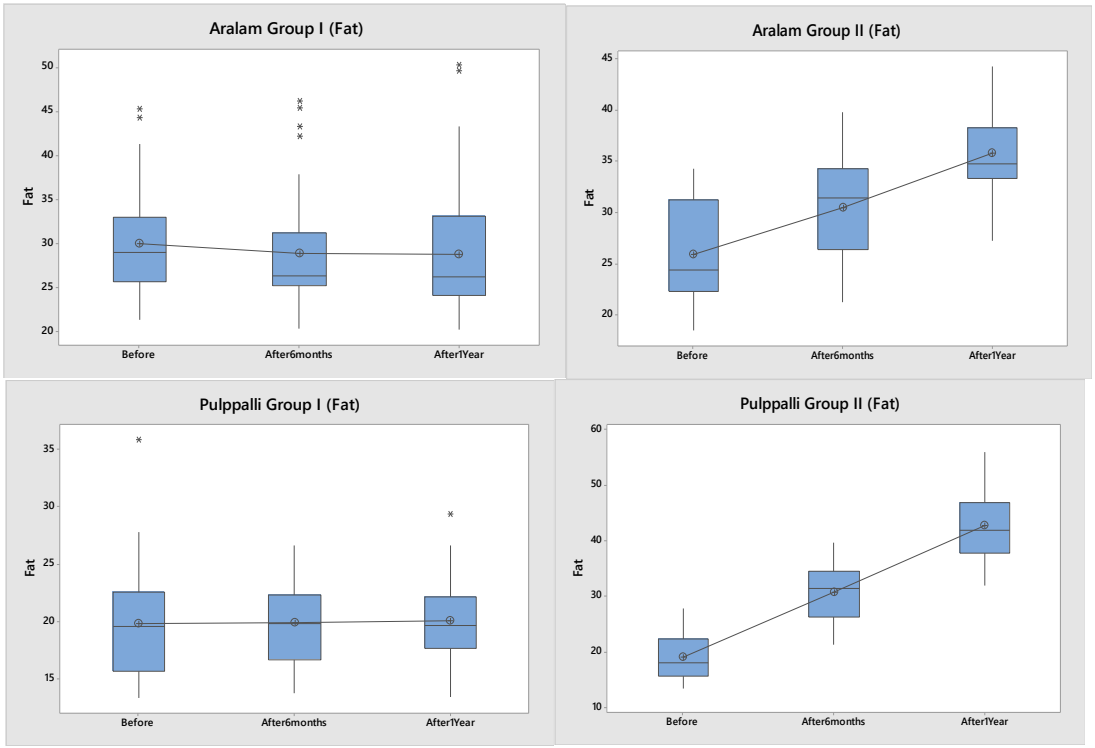

Figure. 7

Therefore, monitoring weight and height and body mass index is essential to determine the adequacy of energy intake for the selected tribal girls. Generally, the requirement of protein is met even in economically disadvantaged populations if caloric intake is sufficient. However, if energy intake is limited, dietary protein may be used to meet energy needs and be unavailable for synthesis of new tissues or for tissue repair. This might be resulted in reduction of growth rate and muscle mass despite an apparent adequate protein intake (Spear and Bonnie, 2002). The same trend was noted in the present study.

3. Mean mineral intake of the selected tribal girls

The dramatic physical growth and development will appreciably increase their requirements of energy, protein, calcium, iron and many other vitamins and minerals. Table 64 showed the details regarding the macro and trace elements consumption pattern of the selected tribal girls.

Table 64: Mean mineral intake of the selected tribal girls

Macro-elements	A.T(Group I) (n=50)			A.T(Group II) (n=50)			P.T(Group I) (n=50)			P.T(Group II) (n=50)		
	Before	After 6 Months	After 12 Months	Before	After 6 Months	After 12 Months	Before	After 6 Months	After 12 Months	Before	After 6 Months	After 12 Months
Ca Mean±SD	542.54± 112.84	549.36± 115.36	515.28± 74.55	522.90±1 12.57	619.04± 118.54	735.3±1 40.48	302.56± 105.35	296.78± 76.98	286.66± 71.48	276.24± 63.36	621.48± 116.37	705.60± 143.58
Max	781	756	649	756	965	897	865.0	526.0	526.0	526.0	869.0	912.0
Min	269	214	358	214	369	398	231.0	135.0	196.0	135.0	358.0	385.0
F Value (P value)	1.54 (0.217)			36.52 (0.000)			0.44 (0.646)			203.43 (0.000)		
Fe Mean±SD	17.41±2.5 8	17.27±2 .53	16.87±2. 48	17.9±3.3 6	22.2±2. 48	26.7±3.1 9	13.84±1 .75	13.64±1 .95	13.07±2 .36	12.88±2. 38	21.08±3. 15	25.69±2.2 3
Max	22.3	22.31	22.16	25.8	26.4	35	16.58	18.30	18.60	18.30	26.30	29.81
Min	12.9	13.26	12.37	12.3	14.7	18	8.16	9.23	8.63	6.48	13.40	21.30
F Value (P value)	0.60 (0.55)			105.02 (0.000)			1.94 (0.15)			308.09 (0.000)		
Zn Mean±SD	4.52±0.94	4.97± 1.70	4.40± 1.08	4.68± 0.76	5.89± 0.84	8.59± 1.16	5.32± 1.27	5.00± 1.26	4.76± 1.08	4.71± 1.09	7.86± 2.16	9.04± 2.43
Max	6.54	9.87	7.3	6.5	8.21	11.28	9.25	7.65	6.54	6.54	12.30	13.20
Min	1.9	1.8	2.05	3.21	3.21	5.36	2.36	2.18	2.36	2.36	2.30	4.60
F Value (P value)	2.75 (0.067)			227.25 (0.000)			2.69 (0.071)			64.25 (0.000)		
Mg Mean±SD	161.5± 22.34	170.6± 31.84	162.04± 22.53	130.4± 17.78	164.44± 23.41	208.96± 32.75	151.94± 14.20	153.67± 14.27	150.50± 14.33	151.80± 15.66	178.66± 35.18	197.94± 37.61
Max	220.0	256.0	223.0	211.0	249.0	263.0	186.54	186.59	196.34	196.34	258.0	268.0
Min	134.0	113.0	126.0	134.0	134.0	120.0	123.34	128.36	128.36	128.36	115.0	120.0
F Value (P value)	1.92 (0.151)			120.18 (0.000)			0.62 (0.541)			27.80 (0.000)		

Group I- Control group, Group II- Experiment group, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months, ICMR RDA (2013)

Table 64 revealed that the selected tribal girls in experimental groups of Aralam and Pulpally acquired a mean Calscium intake of 522.90 mg and 276.24 mg with the standard deviation of 112.57 and 63.36 respectively before the intervention. After six months of intercession, they attained the mean value of 619.04 mg and 621.48 mg with the standard deviation of 118.54 and 116.37. After one year of nutrition intervention and nutrition education the mean consumption of calcium was 735.3 mg and 705.60 mg with standard deviation of 140.48 and 143.58 respectively. There was a significant improvement at one percent level among the both experimental group of tribal girls (Fig. 8). Control group did not exhibit any progress in their calcium intake during the study period of one year.

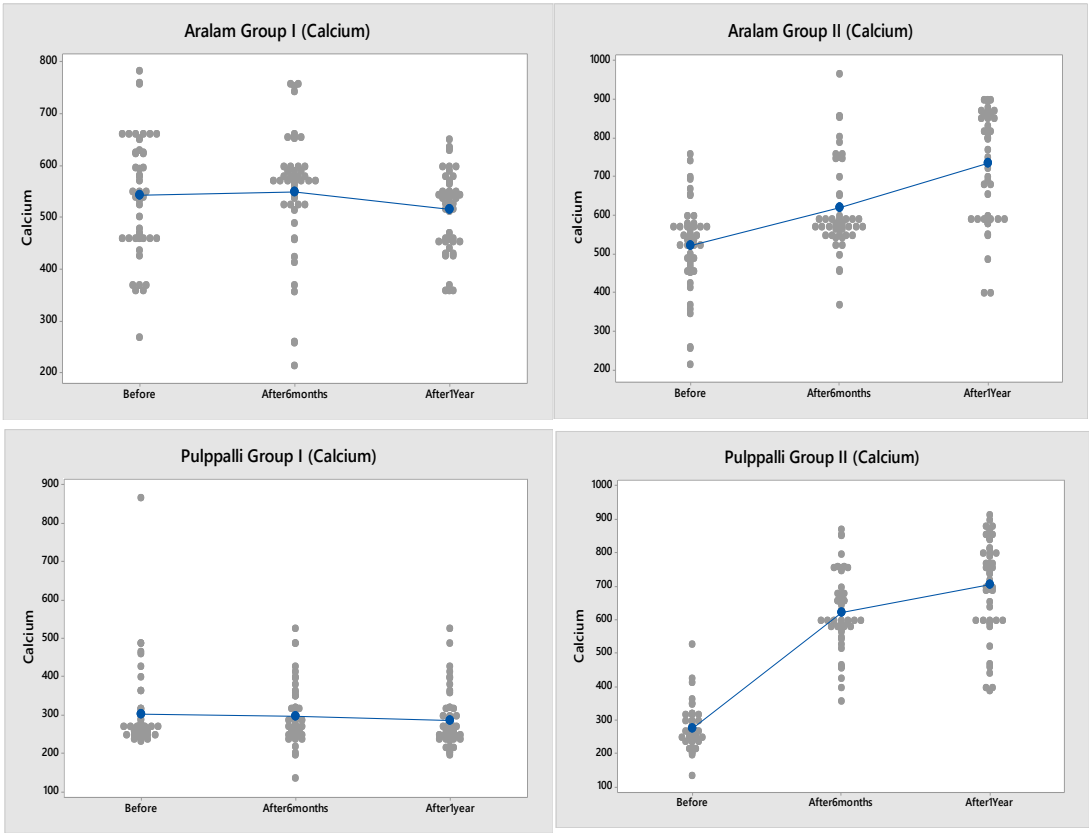

Figure. 8

Table 64 expressed an exact picture of iron intake of the selected tribal girls that the experimental groups from Aralam and Pulpally, scored iron intake with the mean value of 17.9 mg and 12.88 mg with a standard deviation of 3.36 and 2.38 correspondingly in the beginning of the study. This was found to be very deficit to the ICMR suggested RDA (2016). After six month of the intervention, the collected data revealed that there was an improvement in their iron intake with the mean score of 22.2 mg and 21.08 mg with the standard deviation

of 2.48 and 3.15 respectively. After one year, the mean iron consumption was 26.7 mg and 25.69 mg with 3.19 and 2.23 standard deviation respectively. Significant at one percent level among the selected tribal girls in experimental group. The control group failed to show any significant difference (0.55 and 0.15) related to their mean iron intake. The progression is displayed in Figure 9.

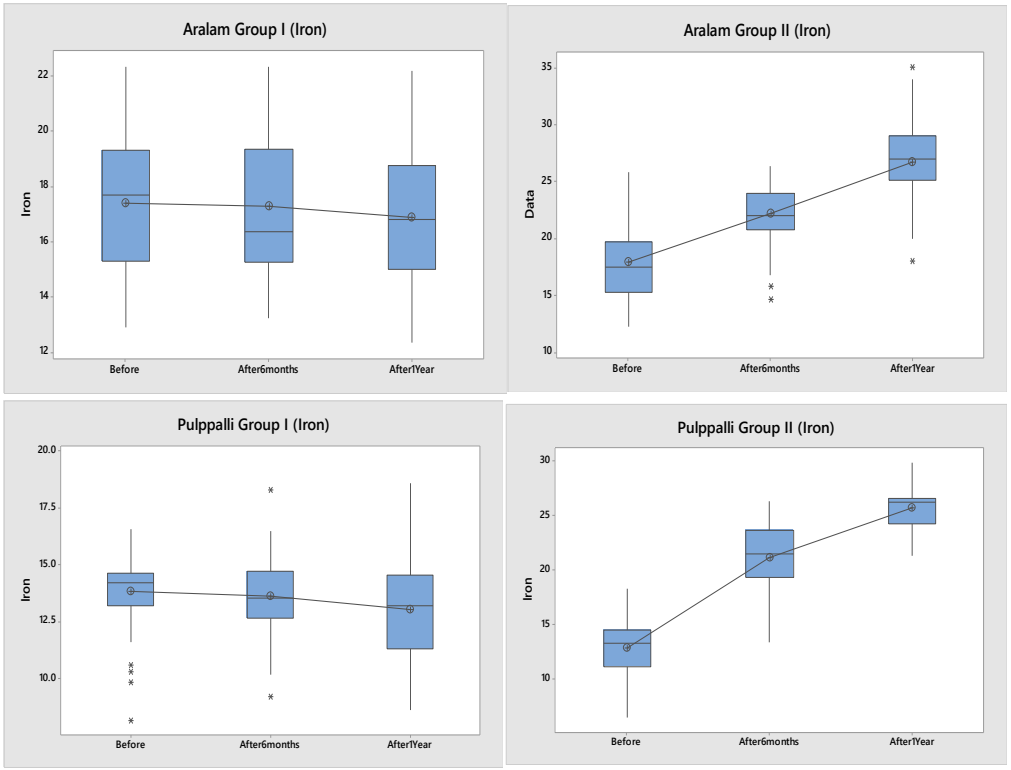

Figure. 9

Table 64 picturized about the consumption level of zinc among the selected tribal girls. Mean score of 4.71 mg and 4.68 mg zinc was consumed in the beginning of the study by the selected tribal girls in the experimental group of Aralam and Pulpally consumed respectively with the standard deviation of 1.09 and 0.76. This was so deficit to ICMR suggested RDA reference value. After six months their mean zinc consumption was 5.89 mg and 7.86 mg and the standard deviation was 0.84 and 2.16 respectively. After one year, the mean of zinc intake was 8.59 mg and 9.04 mg with the standard deviation was 1.16 and 2.43 respectively. The increased progression was shown in Figure 10 whereas the control group did not show any improvement in their zinc consumption.

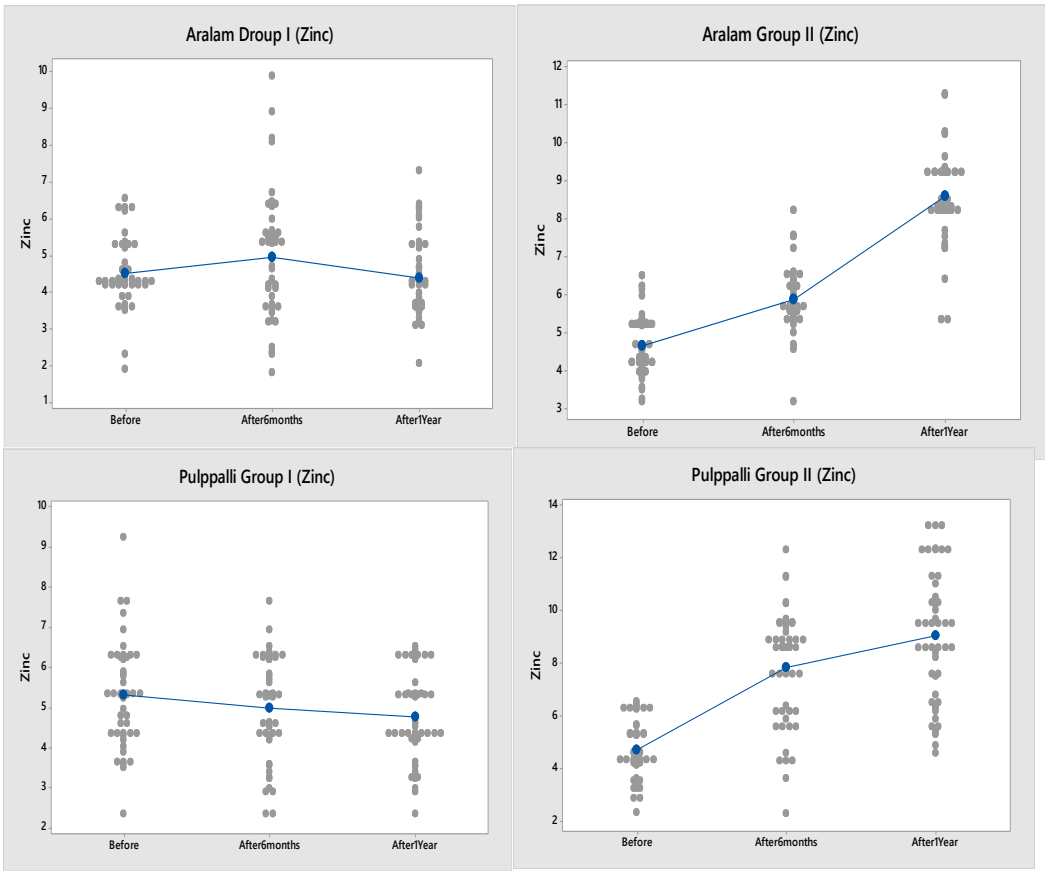

Figure. 10

Table 64 explained that the mean Magnesium intake of the selected tribal girls in experimental groups of Aralam and Pulpally was 130.4 mg and 151.80 mg with the standard deviation of 17.78 and 15.66 respectively. They gradually improved their Magnesium consumption by 164.44 mg and 178.66 mg with standard deviation of 23.41 and 35.18 after six months and 208.96 and 197.94 with standard deviation of 32.75 and 37.61 after one year respectively. The improvement was statistically significant among the experimental group at one percent level (p' value-0.00) and not significant among the control group (p' value- 0.15 and 0.54). Figure.11 proved the progress level of Magnesium consumption.

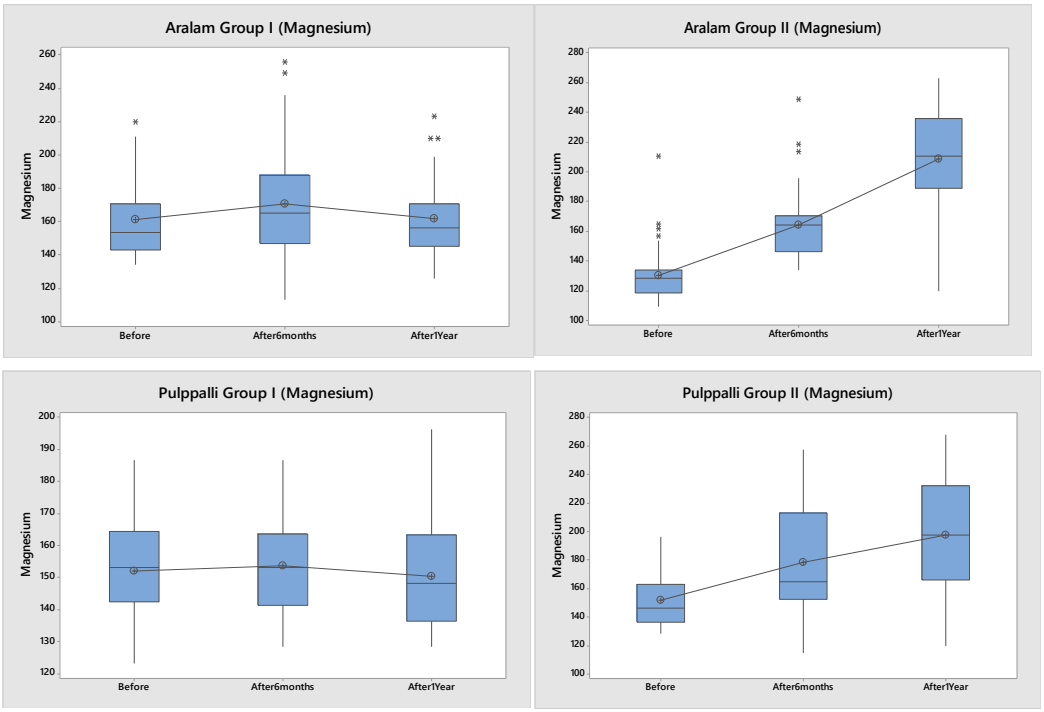

Figure. 11

4. Mean Vitamins intake

Vitamin consumption pattern of the selected tribal girls are discussed in following pages

Table 65: Mean vitamin intake of the selected tribal girls

Vitamins	A.T(Group I) (n=50)			A.T(Group II) (n=50)			P.T(Group I) (n=50)			P.T(Group II) (n=50)		
	Before	After 6 Months	After 12 Months	Before	After 6 Months	After 12 Months	Before	After 6 Months	After 12 Months	Before	After 6 Months	After 12 Months
Betacarotene Mean±SD	3288±943	3216±923	3199±904	2389.64±417.65	3100.5±746.63	4444.74±964.44	2958.70±873.93	2754.90±607.03	2717.02±475.08	2629.12±640.81	3275.20±786.91	4705.66±489.75
Max	5634	4895	4895	3654	4965	6548	4695	4268	5236	4126	4695	5631
Min	2103	1698	1265	1265	2130	2489	1124	1325	1968	1369	1124	3241
F Value (P value)	0.13 (0.878)			98.31 (0.000)			1.87 (0.158)			133.41(0.000)		
Thiamine Mean±SD	0.32±0.12	0.37±0.19	0.35±0.16	0.35±0.16	0.72±0.22	0.99±0.27	0.41±0.12	0.40±0.11	0.39±0.10	0.35±0.10	0.81±0.21	1.04±0.13
Max	0.34	0.91	0.87	0.91	1.49	1.50	0.68	0.65	0.69	0.62	1.30	1.37
Min	0.06	0.08	0.12	0.12	0.06	0.58	0.25	0.16	0.23	0.16	0.40	0.75
F Value (P value)	1.38 (0.254)			106.23 (0.000)			0.28 (0.758)			264.33 (0.000)		
RiboflavinMean±SD	0.40±0.14	0.38±0.13	0.39±0.15	0.43±0.26	0.70±0.27	1.22±0.24	0.38±0.13	0.37±0.12	0.36±0.15	0.36±0.11	0.95±0.23	1.24±0.32
Max	0.65	0.69	0.75	0.98	1.50	1.58	0.67	0.67	0.95	0.61	1.42	1.69
Min	0.20	0.09	0.09	0.19	0.24	0.69	0.19	0.20	0.15	0.19	0.48	0.58
F Value (P value)	0.13 (0.876)			157.48 (0.000)			0.36 (0.700)			183.78 (0.000)		
Niacin Mean±SD	4.78±1.18	4.69±1.43	4.84±1.62	5.18±1.53	10.9±2.63	13.17±2.63	6.26±1.28	6.01±1.33	5.98±1.27	6.26±1.28	13.011±2.81	14.79±2.58
Max	6.35	7.36	8.36	9.65	16.3	18.2	8.45	8.45	8.30	8.54	18.20	19.50
Min	2.21	2.15	2.24	2.35	5.4	6.96	4.25	3.25	3.25	4.31	5.8	6.60
F Value (P value)	0.13 (0.875)			157.05 (0.000)			0.71 (0.494)			187.89 (0.000)		
Vitamin C Mean±SD	28.34±10.63	28.89±6.9	29.85±11.74	27.39±10.29	36.12±9.46	49.81±13.39	20.55±3.31	21.63±4.67	21.79±4.79	20.52±3.31	30.03±11.17	44.00±8.86
Max	56.32	48.26	61.23	56.32	62.19	84.24	26.32	32.70	32.6	26.32	56.32	69.80
Min	12.34	15.36	10.3	12.34	13.8	32.5	13.26	13.25	12.53	13.26	10.60	28.80
F Value (P value)	0.30 (0.744)			51.10 (0.000)			1.23 (0.296)			97.65 (0.000)		
Folate Mean±SD	62.17±20.62	62.10±23.18	61.14±21.90	58.63±21.16	11.45±19.13	150.42±19.75	44.16 ±14.96	44.08±16.28	42.24±12.52	62.24±22.49	141.18±15.82	164.28±24.83
Max	132.32	123.23	122.25	96.87	162.24	186	68.0	71.0	69.0	98.59	165.0	231.0
Min	27.63	23.69	2369	22.65	65.34	96	17.0	18.0	24.0	23.36	111.0	120.0
F Value (P value)	0.03 (0.966)			264.60 (0.000)			0.27 (0.761)			312.87 (0.000)		

Group I- Control group, Group II- Experiment group, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months, ICMR RDA (2013),

Table 65 explained that the selected tribal girls of experimental groups from both Aralam and Pulpally area consumed a mean score of 2389.64 µg and 2629.12 µg of beta-carotene with a standard deviation of 417.65 and 640.81 in the beginning of the study and that was so deficit with the ICMR RDA (2013) reference value. After six month of intervention, the mean intake was 3100.5 µg and 3275.20 µg with the standard deviation of 746.63 and 786.91 respectively. After one year, they attained an average of 4444.74 µg and 4705.66 µg with standard deviations 964.44 and 489.75 respectively. The improvement in their beta-carotene consumption was statistically significant at one percent level for both experimental groups and progress was picturized in the graph (Fig. 12). The control groups remained in the same level of beta-carotene consumption throughout the study period (P' values- 0.88 and 0.16).

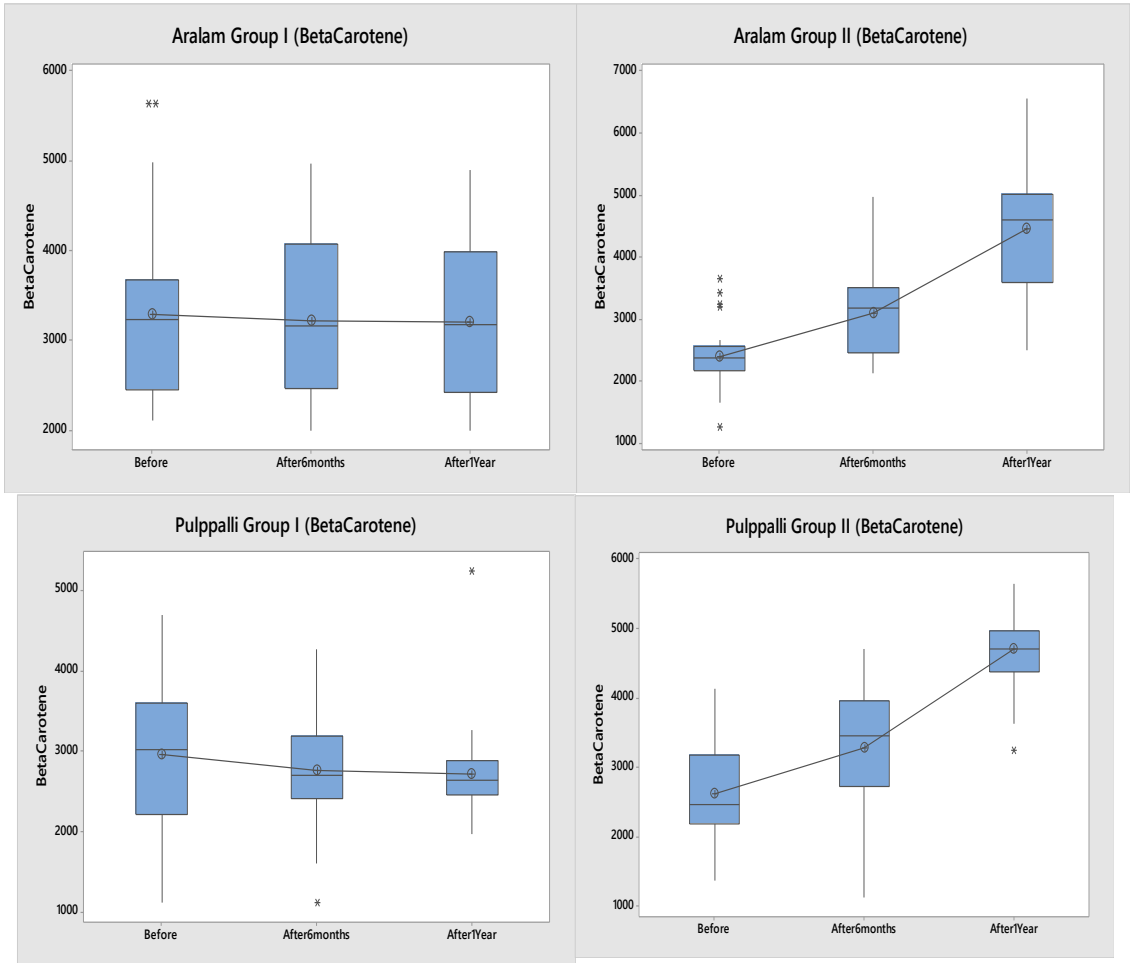

Figure. 12

Table 65 revealed that the thiamine intake of the selected tribal girls of experiment groups from both Aralam and Pulpally areas were with the mean score of 0.35 mg for each group with the standard deviation of 0.16 and 0.10 respectively in the beginning of the study. Then the mean value was recorded much improved intake after one year with the mean value of 0.99 mg and 1.04 mg with the standard deviations of 0.27 and 0.13 respectively. This progress was denoted in the graph (Fig.13) and it was significant at one percent level among both experimental groups. The control group didn't show any significant progress during the study period of one year.

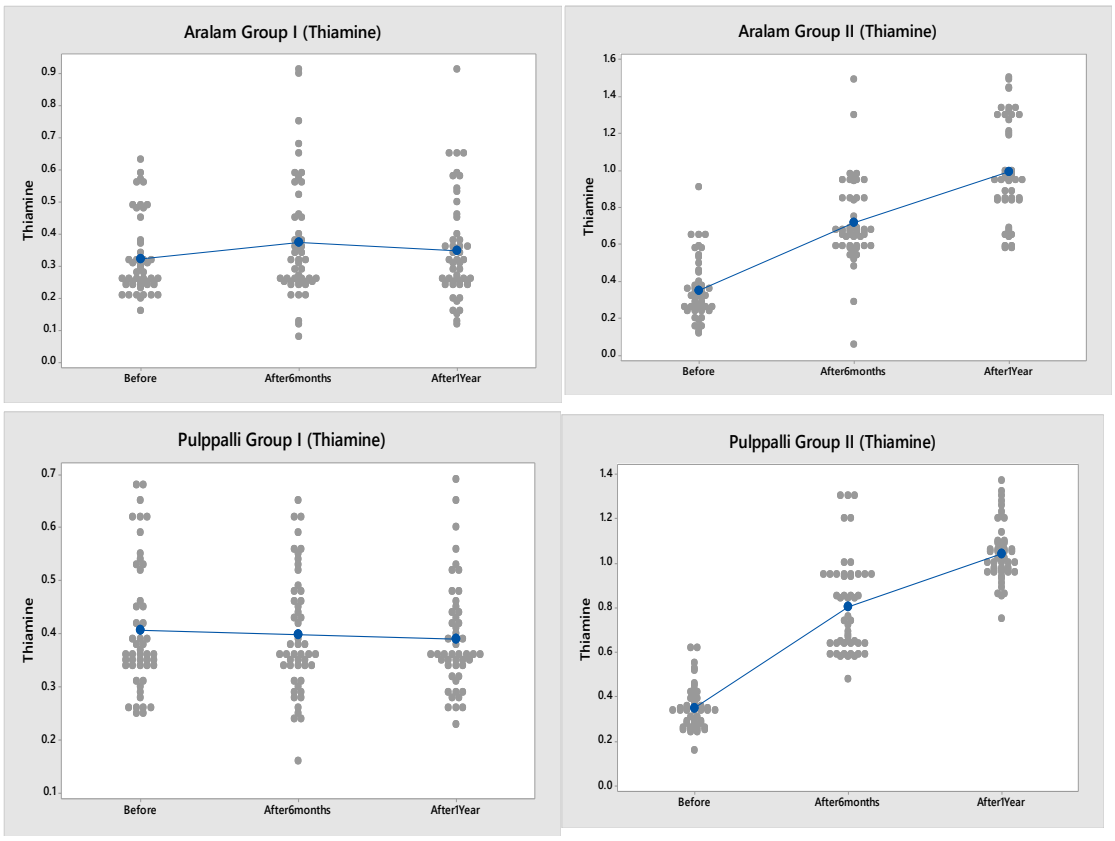

Figure. 13

Table 65 revealed that the riboflavin intake of selected tribal girls in the experiment groups from both Aralam and Pulpally and the mean intake was 0.43 mg and 0.36 mg with the standard deviation of 0.26 and 0.11 respectively in the beginning of the study and recorded much improved score after one year with the mean of 1.22 mg and 1.24 mg with the standard deviation of 0.24 and 0.32 respectively. This progress was denoted in the Figure 14 and it was significant at one percent level among both experimental groups. The control group didn't show any significant progress during the study (0.88 and 0.70).

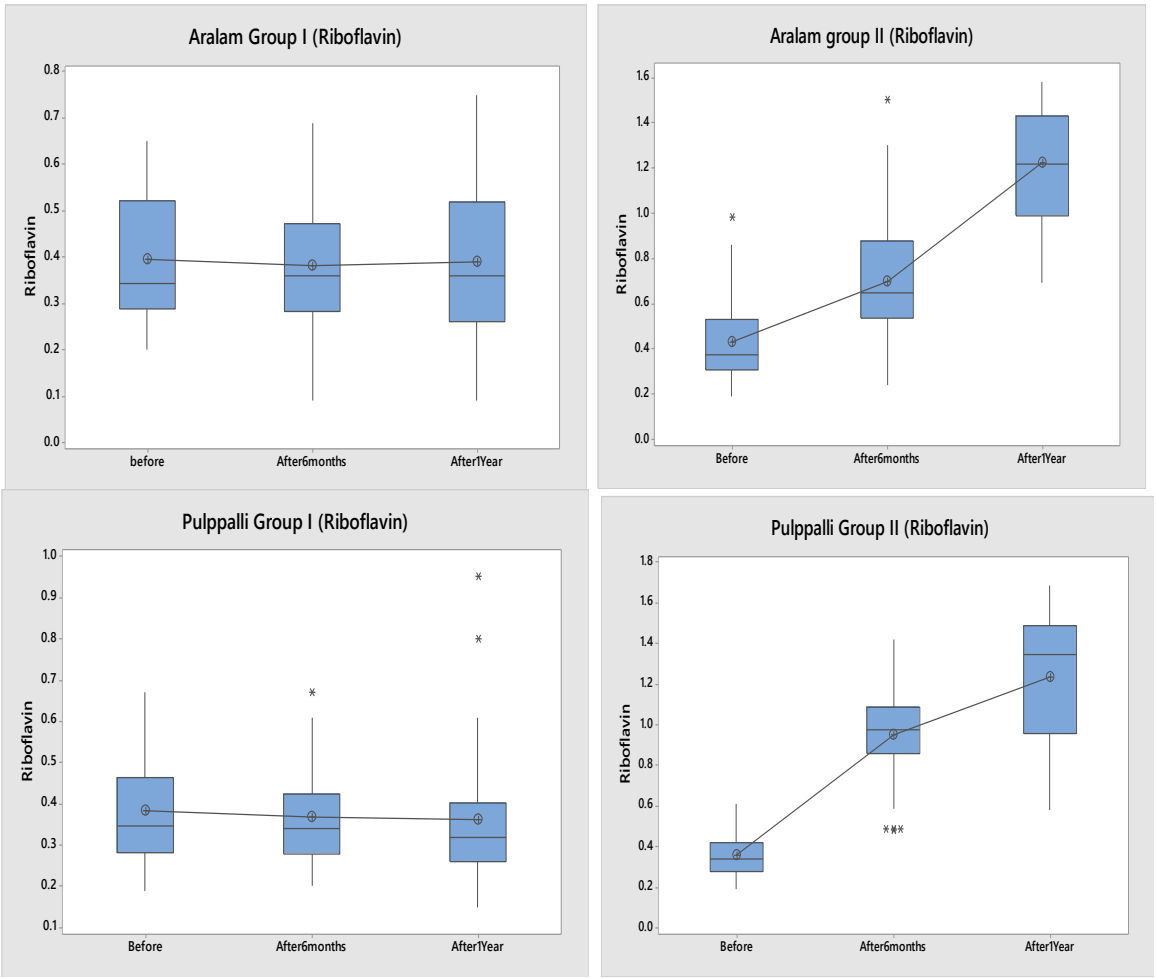

Figure. 14

Table 65 explained that the selected tribal girls in experimental group from both Aralam and Pulpally area consumed the mean score of 5.18 mg and 6.26 mg of niacin with a standard deviation of 1.53 and 1.28 in the beginning of the study and that was so deficit with the ICMR RDA (2013) reference Value. After six month of intervention period they reached up to the average of 10.9 mg and 13.011mg with the standard deviation of 2.63 and 2.81 respectively. After one year they attained mean value 13.17 mg and 14.79 mg with standard deviations 2.63 and 2.58 respectively. The improvement in their niacin consumption was statistically significant at one percent level for both experimental groups and progress picturized in the Figure 15.

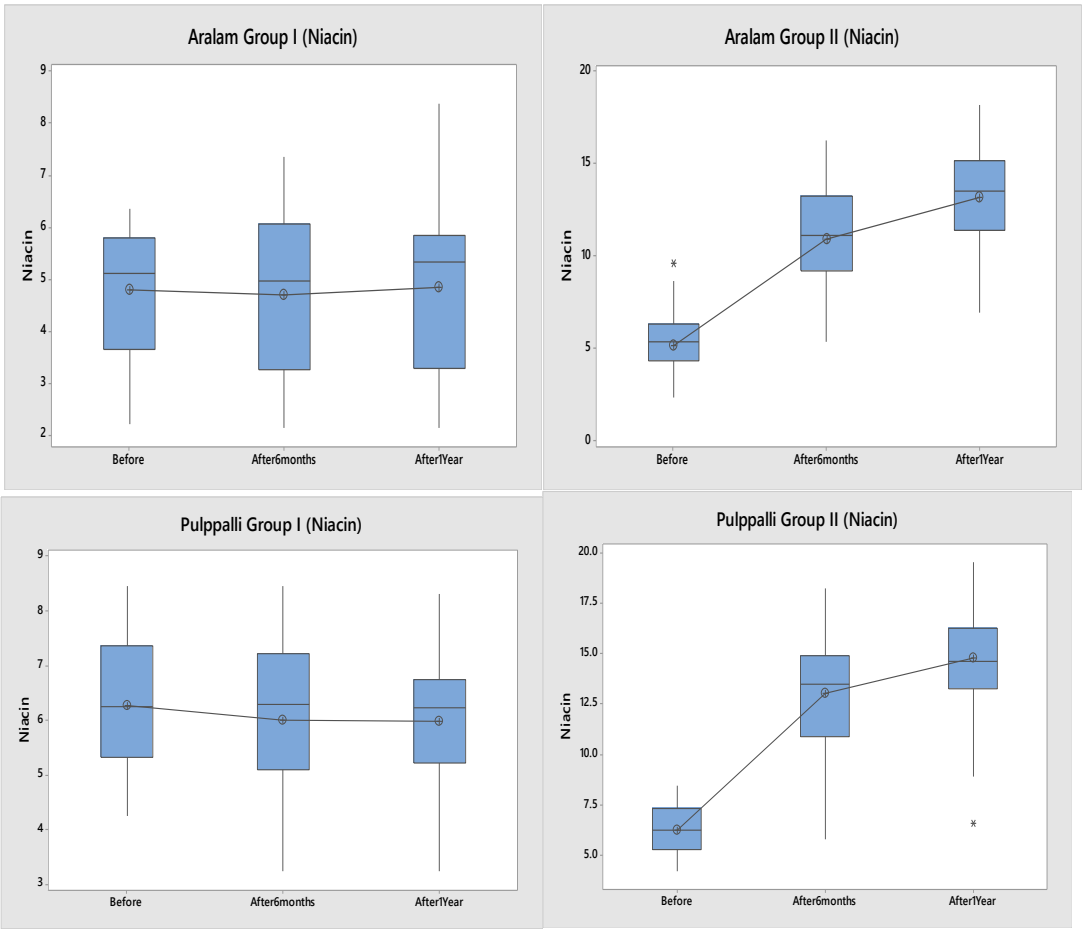

Figure. 15

Table 65 revealed that vitamin C intake of the selected tribal girls in experiment groups from both Aralam and Pulpally were the mean intake of 27.39 mg and 20.52 mg with the standard deviation of 10.29 and 3.31 respectively in the beginning of the study and recorded much improved score after one year with an average intake of 49.81 mg and 44.00 mg with the standard deviations of 13.39 and 8.86 respectively. This progress was denoted in the Figure 16 and it was significant at one percent level among both experimental groups. The control group didn't show any significant progress during the study (p value 0.74 and 0.3).

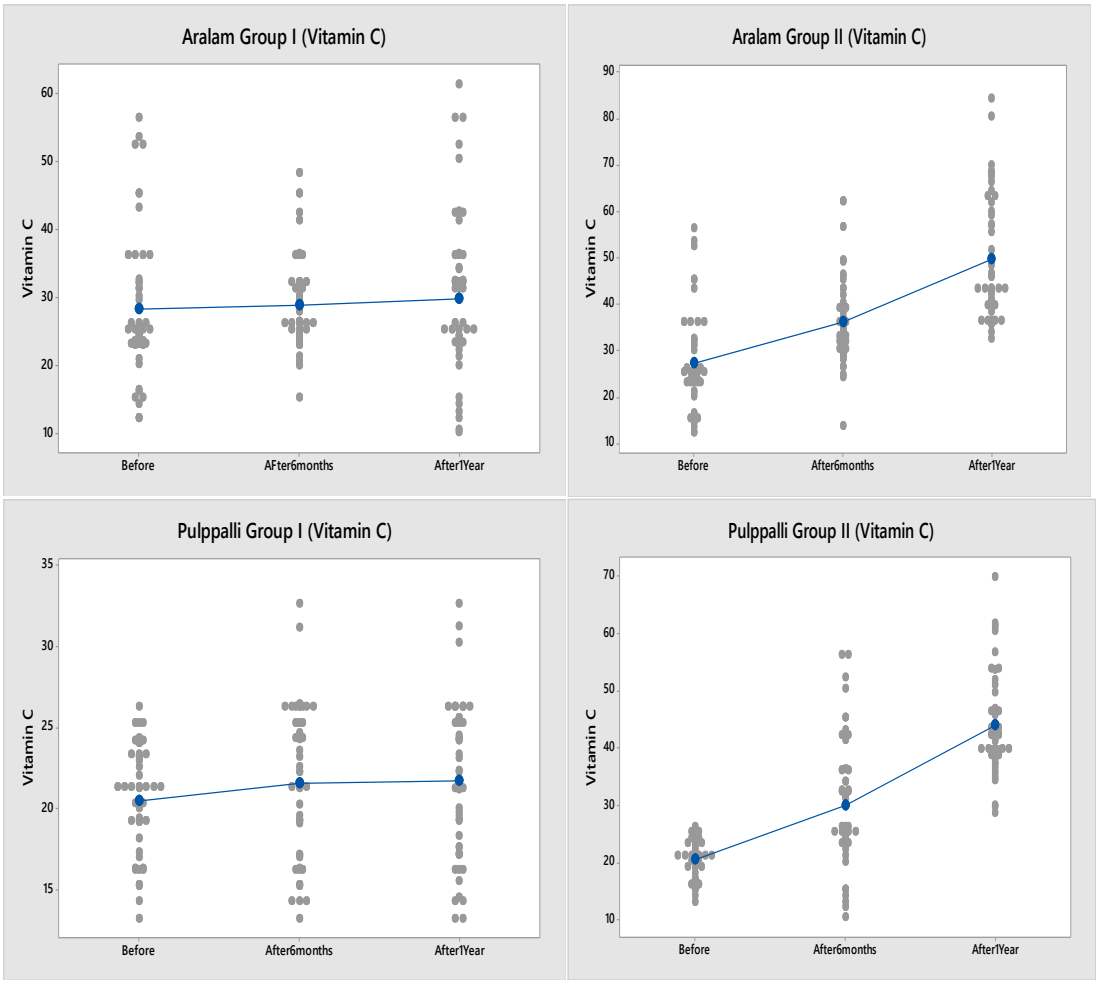

Figure. 16

Table 65 revealed that the folate intake of the selected tribal girls in experiment groups from both Aralam and Pulpally area were the mean intake of 58.63 µg and 62.24 µg with the standard deviation of 21.16 and 22.49 respectively in the beginning of the study and they recorded much improved score after one year with an average of 150.42 µg and 164.28 µg with the standard deviations of 19.75 and 24.83 respectively. This progress was denoted in the Figure 17 and it was significant at one percent level among both experimental groups. The control group didn't show any significant progress during the study.

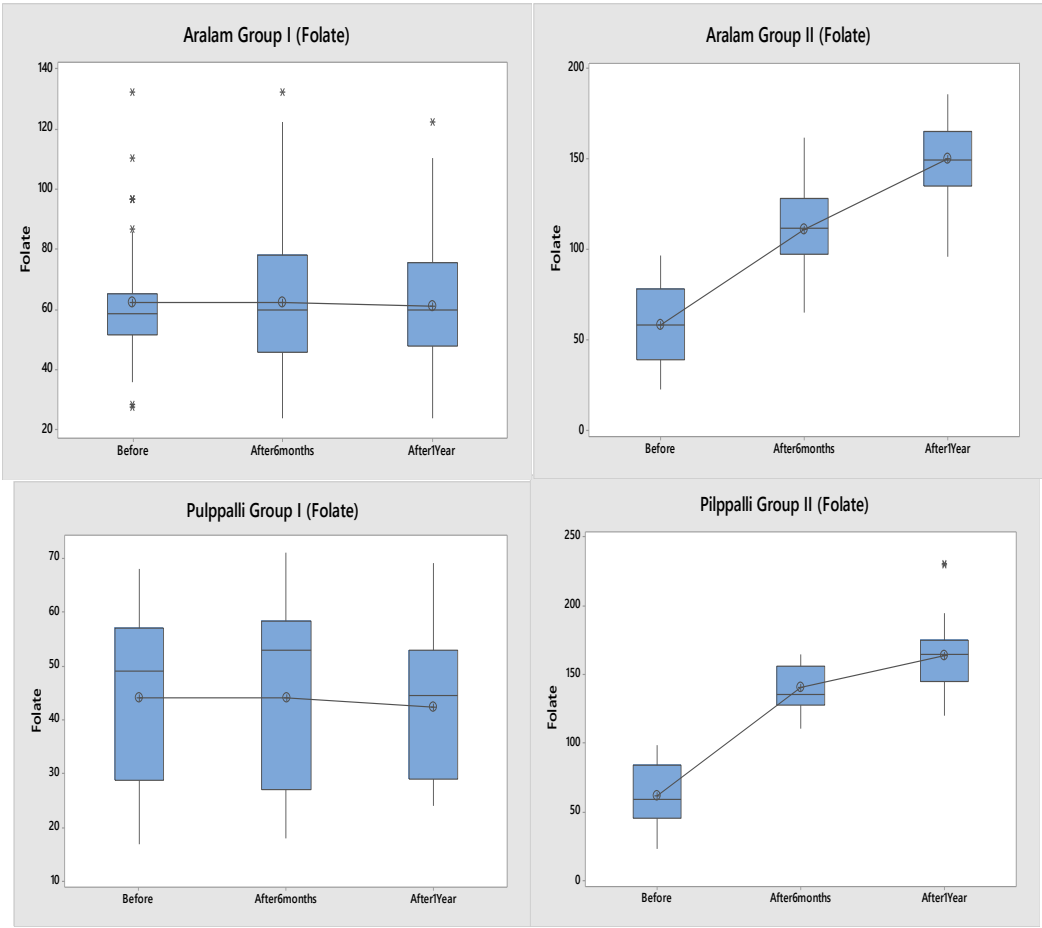

Figure. 17

Tables 63, 64 and 65 postulated that the nutrient intake of the selected tribal girls and significant improvement was noted among the selected tribal girls in the intervention programs.

H0.4. Nutrition intervention program do not have any significant influences on height, weight, and BMI among the selected tribal girls.

H1.4. Nutrition intervention program have significant influences on height, weight, and BMI among the selected tribal girls.

There was one null hypothesis (H0.4) and an alternative hypothesis was framed before the study to assess the influences of nutritional intervention study on the height, weight and BMI of the selected tribal girls. To analyze this hypothesis, investigator tested ANOVA among the variables and the result is given in the following Tables.

b. Assessment of nutritional status of the selected tribal girls

1. Anthropometric measurements

Poor nutrition during pregnancy, infancy, childhood, and adolescence can result into stunted physical, mental and social development with lifelong consequences (Hoddinott et al., 2013) and needs to give an importance to assess the nutritional and health status.

i. Mean height of the selected tribal girls

The nutritional status of the population has well-established, profound effects on health throughout the lifecycle and is closely associated with cognitive and social development, particularly in early childhood and adolescence. The mean height of the selected tribal girls was depicted in Table 66.

Table 66: Mean height of the selected tribal girls

Mean height	Reference*	A.T(Group I) n=50			A.T(Group II) n=50			P.T(Group I) n=50			P.T(Group II) n=50		
		Before	After (6M)	After (12M)	Before	After (6M)	After (12M)	Before	After (6M)	After (12M)	Before	After (6M)	After (12M)
Mean±SD	156.5 cm	147.18±6.0	148.32±5.95	149.52±6.1	151.54±5.38	152.66±5.59	153.74±5.64	148.60±6.95	150.14±7.0	151.78±7.04	146.22±7.43	147.86±7.33	148.8±7.35
F Value (P value)		1.87 (0.15)			1.97 (0.14)			2.58 (0.08)			1.54 (0.22)		
Maximum		160	162	163	160	162	162	159	160	161	158	159	160
Minimum		130	132	132	138	139	139	163	130	132	129	130	132

Group I- Control group, Group II- Experiment group, *ICMR (2013), A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 66 revealed that there was no significant difference between the height level of the experimental group and control group before and after the intervention among the tribal girls from both study areas (Fig. 18). The tribal girls did not reach the reference value for height which should be attained by the aged between 13 and 15 years.

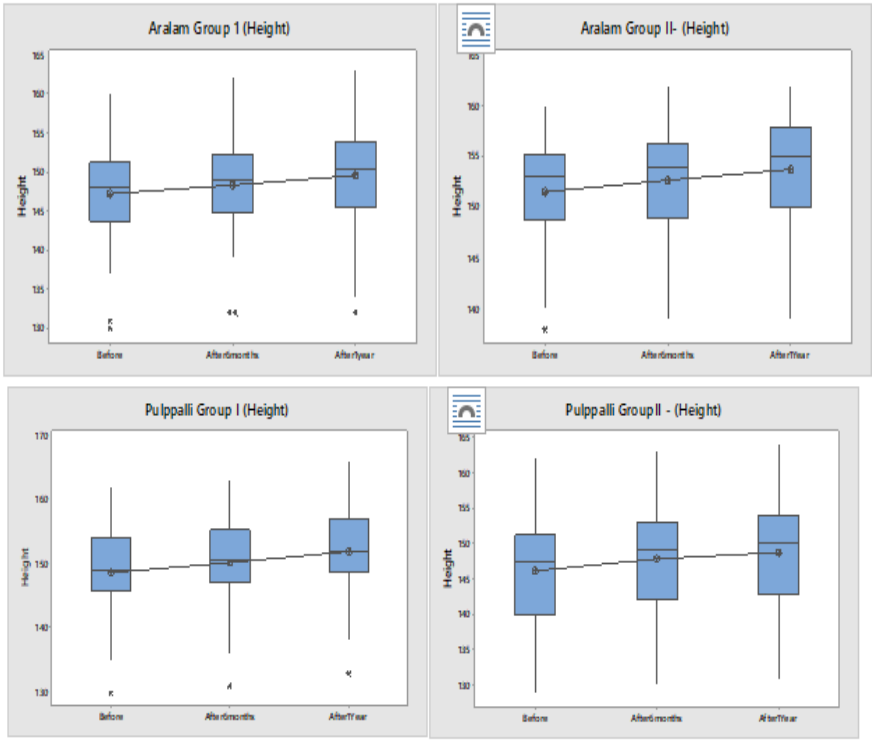

Figure. 18

The Rapid Survey of Children (RSOC 2013–2014) conducted by the Department of Women and Child Development showed that 44 percent of girls (10–18 years) in India, were severely thin and additional 19 percent were moderately thin or under-nourished. Nutritional status of young girls were also varied across the states and social classes. Within India, stunting is highest (54%) among scheduled tribes (ST) children (UNICEF, 2017). The same trend was noted in the present study.

ii. Mean weight of the selected tribal girls

Table 67 discussed about the deviation in the weight of the selected tribal girls before and after the intervention for the period of one year.

Table 67: Mean weight of the selected tribal girls

Mean weight	Reference*	A.T(Group I) n=50			A.T(Group II) n=50			P.T(Group I) n=50			P.T(Group II) n=50		
		Before	After (6M)	After (12M)	Before	After (6M)	After (12M)	Before	After (6M)	After (12M)	Before	After (6M)	After (12M)
Mean±SD	46.6	35±4.7	36±4.57	36.08±4.74	38.3±5.40	40.02±5.68	42.30±5.41	35.64±5.64	36.10±5.47	36.04±5.48	32.30±6.51	34.28±6.44	38.02±6.15
F value (P value)		0.76 (0.47)			6.66 (0.002)			0.10 (0.90)			110.44 (0.00)		
Maximum		44	45	46	54	57	58	46	46	47	52	53	56
Minimum		24	26	25	27	29	32	24	23	24	21	22	26

Group I- Control group, Group II- Experiment group, *ICMR (2010), A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 67 explicated that there was a significant difference at one percent level between the mean weights of the experimental group when compared to control group from both the study areas.

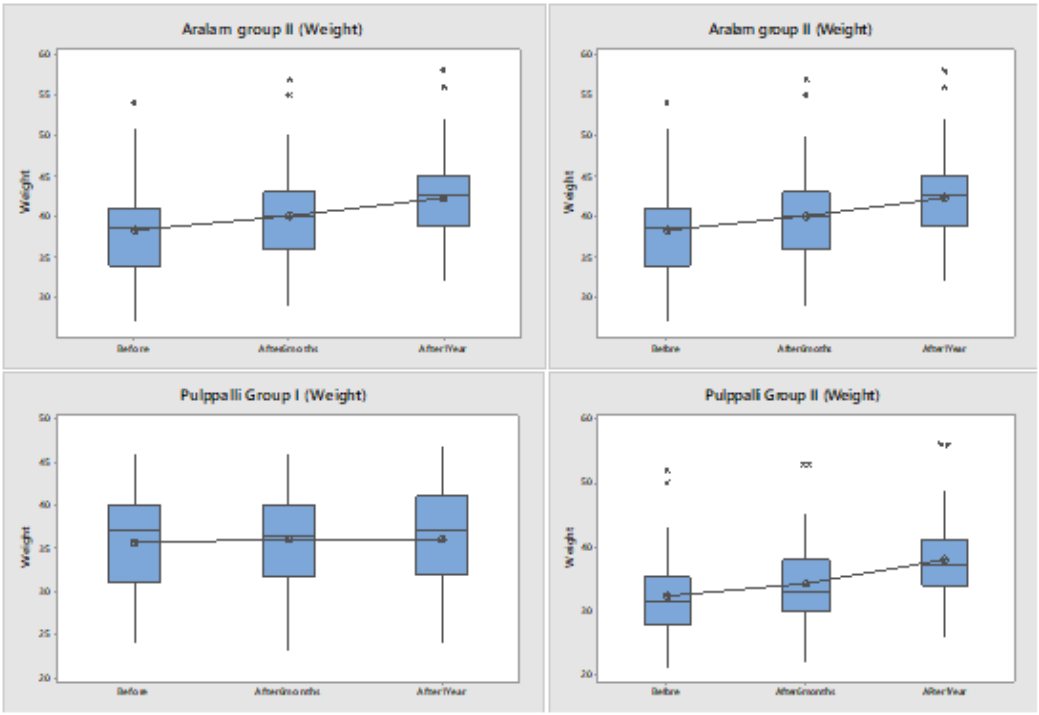

Figure. 19

The results exposed that the nutrition interventions including dietary modifications and nutrition education significantly influenced the experimental groups to improve their weight during the study period of one year (Fig. 19).

iii. Mean Body Mass Index (BMI) of the selected tribal girls

BMI classification was carried out with the specification of WHO (2013). The ailment of undernutrition indicated the deprived nutritional state causing from lack of food consumption or diminished body metabolism. Calculating the Body Mass Index is one of the screening method to regulate the nutritional status of the young children (Ankita et al., 2019). Table 68 highlighted the effect of nutritional intervention on the BMI of the selected tribal girls.

Table 68: Mean BMI of the selected tribal girls

Mean BMI	Reference*	A.T(Group I) n=50			A.T(Group II) n=50			P.T(Group I) n=50			P.T(Group II) n=50		
		Before	After (6M)	After (12M)	Before	After (6M)	After (12M)	Before	After (6M)	After (12M)	Before	After (6M)	After (12M)
Mean±SD	19	16.10±1.71	16.18±1.64	16.11±1.70	16.63±1.79	17.12±1.81	17.85±1.65	16.07±1.75	15.94±1.69	15.58±1.72	14.99±2.05	15.59±1.96	17.10±1.80
F Value (P value)		0.04 (0.96)			6.17 (0.003)			1.07 (0.35)			15.69 (0.00)		
Maximum		20.05	19.56	19.77	22.77	23.73	23.23	21.29	19.82	20.61	21.93	22.06	23.01
Minimum		12.58	12.72	12.71	13.56	13.97	14.61	12.33	12.44	12.28	12.16	12.74	13.39

Group I- Control group, Group II- Experiment group, *ICMR (2010), A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

The finding of this study supported the conclusion of Onis and Lobstein (2010) that BMI is a very sensitive index and it should be measured carefully and cautiously. BMI should be reported and interpreted wherever the measurements of height and weight presented. This study revealed that the tribal girls suffered from severe malnutrition and extreme thinness. Statistical interpretation showed that the nutritional interventions significantly improved the nutritional status of the selected tribal girls in both experimental groups at one percent

confidence level. Even though the selected tribal girls did not show any sudden change in their nutritional status, and amended gradually and gained better result after one year, whereas the control group did not show any progress in their nutritional status (Fig. 20).

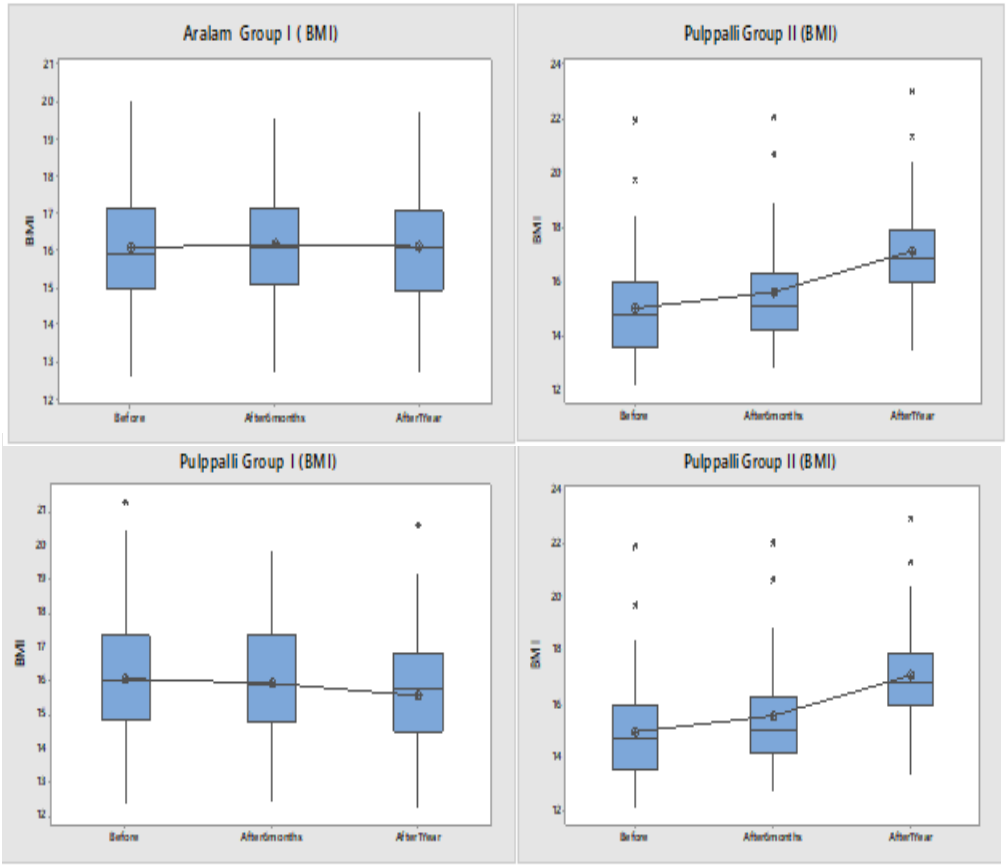

Figure. 20

From tables, 66, 67 and 68 it was cleared that the nutrition intervention programs did not influence height of the selected tribal girls. But it had a positive influences on the weight and BMI of the selected tribal girls in experimental groups. Results of the study concluded that these types of nutrition intervention were continued for long term, health and nutrition status of the tribal population can be sustainably improved.

c. Clinical profile of the selected tribal girls

Along with the diet history and food consumption pattern, clinical examination is an important tool to determine the nutritional status of the selected tribal girls. The selected tribal girls underwent a detailed clinical examination before and after the study period of one year by medical professionals for identifying the clinical symptoms related nutrition deficiencies.

H0.5. There is no significant influence on clinical symptoms of anemia among the selected tribal girls by nutrition intervention programs.

H1.5. There is significant influences on clinical symptoms of anemia among the selected tribal girls by nutrition intervention programs.

One null hypothesis and one alternative hypothesis was constructed prior to the study to evaluate the effect of interventions on the clinical symptoms of anemia among the selected tribal girls. ANOVA was tested among the variables to find out the significance. Results were explained in the following tables.

Table 69: Clinical symptoms of Anemia experienced by the selected tribal girls

Clinical symptoms of Anemia	A.T(Group I) (n=50)			A.T (Group II) (n=50)			P.T(Group I) (n=50)			P.T (Group II) (n=50)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Entire body												
Dizziness	12	13	14	13	10	4	28	28	27	33	19	2
Fatigue	50	50	49	50	32	11	50	50	48	50	19	0
Malaise	50	50	50	50	37	19	50	50	49	50	30	5
Heart												
Palpitation and Shortness of breath	25	25	25	24	18	9	39	39	38	36	19	2
Nails												
Koilonychia	8	8	7	9	9	4	11	11	11	18	18	11
Paled nails	50	50	50	50	38	12	50	50	50	50	36	9
Brittle nails	14	14	13	13	10	7	22	22	22	21	20	10
Paleness												
Paled conjunctiva	50	50	50	50	38	12	50	50	50	50	34	8
Paled lips	50	50	50	50	37	13	50	50	49	50	35	9
Paled tongue	50	50	50	50	36	11	50	50	49	50	36	9

Group I- Control group, Group II- Experiment group, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 69 revealed that the cent percent of the selected tribal girls had clinical signs of anemia. Paleness, fatigue and malaise were common among the selected tribal girls in the experimental and control group of both study area. Experimental group from the Pulpally area had significant improvement in minimizing the occurrence of the symptoms of anemia. Out of 50, only eight to nine tribal girls had the paleness after one year of study period. None of the experimental group tribal girls from Pulpally had fatigue, only five tribal girls had malaise, only two tribal girls had palpitation and shortness of breath after one year.

In Aralam experimental group also showed significant progress in their prevention of the symptoms of anemia. Out of 50 tribal girls 11 to13 tribal girls had the paleness, 11 tribal girls had the fatigue and 19 tribal girls had the malaise after one year of the intervention whereas, there was no significant changes in the clinical symptoms of anemia among the selected girls in the control groups (Fig. 21).

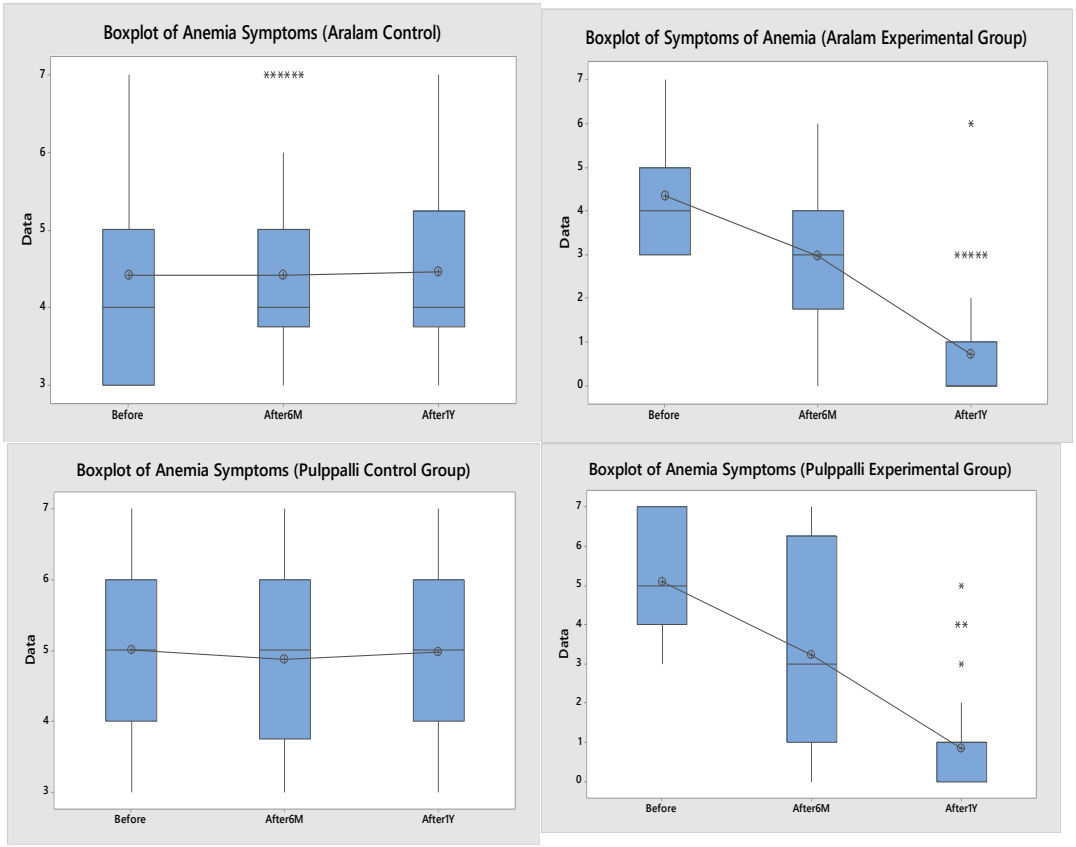

Figure. 21

1. One Way ANOVA on the clinical symptoms of anemia.

Table 70 explained about the significant deviation of the clinical symptoms experienced by the selected tribal girls after one year of the nutrition interventions.

Table 70: One Way ANOVA on the clinical symptoms of anemia

One way ANOVA on Anemia Symptoms	AT (Group I)		AT (Group II)		PT (Group I)		PT (Group II)	
	F Value	P value	F Value	P value	F Value	P value	F Value	P value
	0.02	0.98	79.72	0.000	0.10	0.90	71.37	0.000

Group I- Control group, Group II- Experiment group

The data revealed that both the experimental group attained a significant deviation at one percent confidence level in their clinical symptoms of anemia, after the one year of the

nutrition intervention. It revealed that the nutrition interventions reduced the occurrence of the symptoms of anemia among the selected tribal girls in the experimental groups.

2. Correlation between the Iron intake and clinical symptoms of anemia

It was already discussed about the dietary intake of Iron consumption by the control and experimental group of the selected tribal girls. Table 71 highlighted the correlation between the iron intake and clinical symptoms of anemia of the selected tribal girls.

Table 71: Correlation between Iron Intakes with Clinical symptoms of Anemia.

Anemia symptoms with Iron Intake	AT (Group I)		AT (Group II)		PT (Group I)		PT (Group II)	
	Carl-Pearson correlation	P value	Carl-Pearson correlation	P value	Carl-Pearson correlation Value	P value	Carl-Pearson correlation Value	P value
Before the Study	-0.627	0.00	-0.727	0.00	-0.960	0.00	-0.878	0.00
After 6 Months	-0.351	0.002	-0.669	0.00	-0.371	0.00	-0.778	0.00
After 1 Year	-0.390	0.005	-0.518	0.00	-0.479	0.00	-0.546	0.00

Group I- Control group, Group II- Experiment group

The above data cleared that there was a strong negative association at one percent level between iron intake and anemia symptoms in both experimental and control group alike. It was revealed that, the clinical symptoms of anemia decreased when there was an increased nutritional intake of iron. It might be due to the nutrition intervention in terms of nutrition education and raising of nutrition garden.

3. Effect of nutritional intervention on other clinical symptoms of the selected tribal girls

Clinical signs are the sign board towards the nutritional deficiency. Table 72 described about the nutritional deficiency symptoms experienced by the selected tribal girls and their clinical profile after the one year of nutritional intervention.

Table 72: Effect of intervention on clinical symptoms of nutritional deficiencies

Clinical symptoms* (N=50)	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Eyes												
Retinal hemorrhage	-	-	-	-	-	-	2	2	2	4	4	2
Blurred vision	6	6	6	8	8	4	10	10	10	8	8	6
Nyctalopia	4	4	4	6	6	4	8	8	8	10	10	6
Dry eye (Xerophthalmia)	8	8	8	6	6	4	10	10	10	12	12	8
Bitot's spots	-	-	-	4	4	4	6	6	6	8	8	8
Teeth & Gums												
Bleeding gums	10	10	10	12	10	6	12	12	12	16	14	8
Hair												
Dry hair	24	24	24	26	24	18	32	32	32	30	26	14
Dandruff	44	44	50	42	40	24	48	48	48	46	44	32
Brittle hair	36	36	38	34	32	28	34	34	34	38	34	26
Nail												
White marks	22	22	22	20	20	16	18	18	18	24	24	18
Mouth												
Canker sores	22	22	24	24	20	14	26	26	28	24	22	12
Glossitis	10	12	12	12	12	10	14	14	14	12	12	10
Cheilosis	8	8	8	14	12	6	16	16	16	18	14	8
Skin												
Bumps on the back of the arm	12	12	12	14	8	6	14	14	14	16	14	8
Dry or rough skin	36	36	36	38	34	24	42	42	42	44	42	26
Dermatitis	10	10	10	12	12	10	14	14	14	12	12	8
Clinical symptoms* (N=50)	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M

Psychological												
Stress	52	52	54	54	46	32	46	46	50	52	44	24
Depression	16	16	16	18	14	6	14	14	14	16	12	4
Nervousness	36	36	36	32	28	18	20	20	22	30	26	12
Insomnia	16	16	16	14	6	2	18	18	18	22	18	6

Group I- Control group, Group II- Experiment group*Multiple responses, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

From the above table, it could be seen that many of the selected tribal girls (both experimental and control) were experienced the clinical symptoms of nutrient deficiencies such as Thiamine, Vitamin A, Vitamin B12, Vitamin C, Biotin (B7), Zinc, Niacin, Riboflavin, Pyridoxine, Calcium, folic acid, Protein, and Essential fatty acid. It was shocked to note that tribal girls from the Pulpally area experienced more symptoms of nutrition deficiencies than the Aralam area. Four and eight percent of the selected tribal girls from control and experimental group of Pulpally tribal area had the clinical symptom of Nyctalopia, and Ten and 12 percent of the tribal girls had the vision problem of Xerophthalmia, six and eight percent of the tribal girls had Bitot's spot in their conjunctiva. All these were the indicators of Vitamin A deficiency. All the clinical symptoms of the vitamin A deficiency showed little improvement in the selected tribal girls in experimental group except Bitot's spot. Thirty and 36 percent of the selected tribal girls had dry hair, 48 and 46 tribal girls had dandruff, 42 and 44 percent of the selected tribal girls in both study areas had dry and rough skin which were the deficiency of Biotin, zinc, niacin, riboflavin, and pyridoxine respectively. The experimental group of tribal girls showed slight reduction in their clinical symptoms after one year of the study

d. Effect of intervention programs on menstrual status of the selected tribal girls

According to the study of Lee et al. (2016), seventy five percent of the young girls suffered from menstrual discomforts including painful, delayed, irregular, and heavy bleeding. Rowland (2002) taught that the environmental factors like the area which they lived, the food they consumed and the climate conditions also affect the menstrual status of the young girls. Some other studies from India suggested that the life style pattern of the young girls also influenced their menstrual status. Table 73 described the menstrual pattern of the selected tribal girls and the effect of the nutrition interventions on life style modification after the one year of study period.

1. Pre-menstrual Symptoms (PMS)

Pre-menstrual symptoms are the combination of physiological and psychological disturbances that occur along with ovulation and expressed with time of menstrual flow. Mood swings are common in most of the woman. Most prominent physical symptoms are bloating, mastalgia, acne, fatigue, food craving and appetite changes. Psychological symptoms includes, depression, irritability, and crying.

Table 73: Pre-menstrual Symptoms experienced by the selected tribal girls

Pre/post Menstrual Symptoms	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Emotional disturbance												
Downheartedness	29	29	27	31	25	13	24	23	22	25	14	9
Nervousness	28	27	26	32	24	9	27	27	27	26	19	8
Bad temper	37	37	37	38	31	12	32	31	31	30	21	10
Decreased Co-ordination	39	39	39	34	26	17	38	36	35	41	32	13
Gastro-intestinal problems												
Bloating	24	23	23	26	21	11	21	21	20	23	19	10
Changes in appetite	29	29	29	31	29	18	33	32	31	30	19	10
Constipation	12	12	12	13	10	7	13	13	13	12	7	5
Fluid retention	18	18	18	16	13	6	14	14	14	15	12	4
Acne	21	21	20	24	20	11	16	16	18	19	13	8
Swollen, painful breasts	19	19	19	21	18	16	17	16	16	20	14	9
Headache	21	21	22	23	19	15	15	15	15	17	13	9
Faintness	9	9	9	8	8	4	6	6	6	7	5	2
Heart palpitation	16	16	17	18	15	7	12	12	12	16	14	8

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 73 elaborated about the PMS and its associated discomforts experienced by the selected tribal girls. It was observed that Aralam tribal girls showed more affinity towards PMS than the Pulpally tribal girls. Seventy six percent of the tribal girls from the Aralam experimental group

and 78 percent of tribal girls of the control group suffered from the emotional disturbance like downheartedness, nervousness, bad temper and decreased co-ordination. The experimental group showed a clear improvement in their emotional imbalance after one year of intervention. Twenty six tribal girls, out of 50 tribal girls from the Aralam experimental group experienced bloating and 30 percent of tribal girls relived from this problem after the one year. Sixty two percent of the tribal girls had a feeling of appetite changes and after one year, 62 percent was reduced to 26 percent and free from this problems.

2. **Dysmenorrhea**

Young age is the transition period and all the young girls went through chains of physical and physiological changes. During this time most of the young girls suffering from many types of menstrual discomforts and disorders. Excessive bleeding, irregular menstruation and dysmenorrhea are the most affected distraction among them. Dysmenorrhea is the severe menstrual cramp associated with menstruation. Table 74 explained the dysmenorrheal symptoms experienced by the selected tribal girls.

Table 74: Dysmenorrheal symptoms

Dysmenorrheal Symptoms	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Lower abdominal Cramp	22	22	22	21	17	8	24	24	24	23	18	8
Headache	21	21	21	21	14	4	20	20	20	23	12	5
Nausea and vomiting	15	15	15	17	11	5	16	16	16	15	10	6
Diarrhea	21	21	21	18	12	8	18	18	18	19	11	7
Fatigue and weakness	22	22	22	21	15	4	24	24	24	23	16	5
Fainting	13	13	13	14	10	0	16	16	16	18	13	1

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 74 elaborated that both the Aralam and Pulpally tribal girls suffered equally from the dysmenorrheal discomforts equally. Forty six percent of the tribal girls in the experimental group from Pulpally had lower abdominal cramp and headache which were

associated with menstruation. Sixteen and 10 percent of the tribal girls remained in the same situation after one year of nutrition interventions. Forty six tribal girls from the same area suffered from fatigue and weakness in the beginning whereas only 10 percent of the tribal girls had the same problem even after one year of nutrition intervention. Data cleared that the nutrition interventions positively influenced the selected tribal girls in the experimental group belonged to both the study area.

3. Dysfunctional Uterine Bleeding/ Menstrual disorders

ACOG report 2015 commented that, Abnormal uterine bleeding (AUB) or menstrual disorders can be observed among the young girls includes, irregular bleeding, abnormally heavy bleeding, bleeding between periods, and absence of bleeding (Amenorrhea). Table 75 described the menstrual disorders experienced by the selected tribal girls in the study groups.

Table 75: Dysfunctional Uterine Bleeding/ Menstrual disorders experienced by the selected tribal girls

Dysfunctional Uterine Bleeding	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Menorrhagia	7	7	7	6	5	4	8	8	8	11	10	7
Polymenorrhea	8	8	7	9	8	5	6	6	6	7	6	2
Oligomenorrhea	10	10	10	11	9	5	9	9	8	6	5	1
Metrorrhagia	8	8	8	6	6	4	11	11	11	10	9	6

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

From the above table, it was cleared that, 22 percent of the selected tribal girls of experimental group from Pulpally experienced menorrhagia in the beginning of the study and eight percent tribal girls absconded from that condition after one year. Twenty two percent of the selected tribal girls of experimental group from the Aralam suffering from Oligomenorrhea and six tribal girls relieved from this problem after one year. Both control groups remained in the same position before and after the study period of one year.

4. Modification of life style pattern

The life style pattern of the tribal girls is quite alarming and the related data are rare. Preventive health care through improved lifestyle modification become inevitability of the time and consider as the need of the hour of young girls.

i. Sunlight exposure

Sunlight is the free source of Vitamin D which have an essential part in the life of the young girls. Table 76 explained the sunlight exposure of the selected tribal girls.

Table 76: Sunlight Exposure of the Selected Tribal girls

Sunlight Exposure	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
30 Minutes 5-6 D/W	6	6	6	7	24	49	4	4	4	6	32	48
30 Minutes 3-4 D/W	5	5	5	4	19	0	6	6	6	9	5	1
15 Minutes 5-6 D/W	7	7	7	4	3	0	11	11	11	10	7	1
15 Minutes 3-4 D/W	19	19	19	13	4	1	13	13	13	11	4	0
Very less	13	13	13	22	0	0	12	12	12	14	2	0

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

The data from Table 75 expressed that only seven tribal girls of experimental group from the Aralam had enough sunlight exposure and 44 percent experienced very less sunlight exposure before the experimental study whereas 98 percent experienced the exposure of sunlight after one year. In Pulpally experimental group 28 percent had very less exposure of sunlight in the beginning and 96 percent experienced the exposure of sunlight after the one year. The control group did not show any interest in the exposure of the sunlight and not willing to accept the health benefits of sunlight.

ii. Daily exercise

Table 77 explained the daily exercise pattern of the selected tribal girls.

Table 77: Daily exercise pattern of the selected tribal girls

Daily Exercise	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After 6 M	After 12M	Before	After 6M*	After 12M*	Before	After 6 Months	After 12M	Before	After 6 M*	After 12M*
Vigorous activities	5	5	5	3	22	50	1	1	1	2	19	50

Sports activities	5	5	5	3	3	3	-	-	-	1	3	3
Swimming	2	2	2	2	12	14	5	5	5	6	27	32
Dancing	3	3	3	2	28	31	3	3	3	4	29	34
Jerk walking	3	3	3	1	34	50	4	4	4	3	32	50
Not exercising	32	32	32	39	8	0	38	38	38	34	5	0

*Multiple responses, Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

The collected data revealed that the tribal girls did not have the habit of adopting any daily exercise pattern. In the beginning 78 and 68 percent of the experimental tribal girls from both Aralam and Pulpally did not have the habit of adopting exercise. After the study period of one year, all the selected tribal girls started to adopt active life style with daily simple physical activities, and jerk walking. It was noticed that, 70 percent involved in more than one exercise and interested to lead a healthy life.

H0.6. Lifestyle reform do not have any effect on the menstrual status of selected tribal girls

H1.6. Lifestyle reform have significant effect on the menstrual status of selected tribal girls

One null hypothesis and one alternative hypothesis was constructed prior to the study to evaluate the association of lifestyle reform with menstrual status of the selected tribal girls. Correlation was tested among the variables in order to find out the association. Results were explained in the following table.

Correlation between the lifestyle modifications and dysmenorrhea

Said and Mettwaly (2017) explained in their studies that the physical activity and exercise had a great influence to reduce the dysmenorrheal symptoms among the young girls. In the study of Bahrami et al. (2018) proved that the vitamin D supplementation helped to reduce the dysmenorrheal discomforts in the tribal girls. Table 78 pointed out the correlation between the dysmenorrheal discomforts with the lifestyle modification.

Table 78: Correlation between the lifestyle modification and dysmenorrhea among the selected tribal girls

Correlations	AT (Group I)		AT (Group II)		PT (Group I)		PT (Group II)	
	Carl-Pearson correlation	P value	Carl-Pearson correlation	P value	Carl-Pearson correlation Value	P value	Carl-Pearson correlation Value	P value
Correlation of Dysmenorrhea symptoms with Sunlight Exposure								
Before the Study	0.989	-0.00	0.985	-0.00	0.994	-0.00	0.949	-0.00
After 6 Months	0.989	-0.00	0.880	-0.00	0.994	-0.00	0.884	-0.00
After 1 Year	0.989	-0.00	0.694	-0.00	0.994	-0.00	0.652	-0.00
Correlation of Dysmenorrhea symptoms with Water Intake								
Before the Study	0.885	-0.00	0.898	-0.00	0.957	-0.00	0.927	-0.00
After 6 Months	0.867	-0.00	0.654	-0.00	0.948	-0.00	0.743	-0.00
After 1 Year	0.845	-0.00	0.647	-0.00	0.954	-0.00	0.598	-0.00
Correlation of Dysmenorrhea symptoms with Exercise								
Before the Study	0.946	-0.00	0.898	-0.00	0.869	-0.00	0.945	-0.00
After 6 Months	0.938	-0.00	0.765	-0.00	0.879	-0.00	0.756	-0.00
After 1 Year	0.974	-0.00	0.689	-0.00	0.867	-0.00	0.698	-0.00

Group I – Control, Group II- Experiment

The data revealed that the dysmenorrhea had a strong negative association at one percent level (with p value 0.00) with the sunlight exposure, water intake and physical exercise. It indicated that the sunlight exposure, water intake and exercise were reduced, the dysmenorrheal discomforts will be increased and vice versa.

G: Knowledge Attitude and Practice (KAP) study among the Selected Tribal girls

According to USIAD (2011), KAP is a study method to collect both qualitative and quantitative information by formatting standardized questionnaire which includes knowledge, attitude and practices. It records opinion based on statements and helps to recognize the awareness gap, behavioral pattern, and cultural views of the tribal girls about the nutrition, health and reproductive health which will help to identify the requirements, problems and hurdles to implement exact interventions and to prepare proper help plans.

1. KAP on nutritional facets

The data regards the knowledge, attitude and practices related to the nutritional aspects were assessed using specially framed questionnaire (Annexure 5) consisted of 45 questions (15 questions related to nutritional awareness, 15 questions related to nutritional attitude and 15 questions related to practices) and recorded before the study, after six months and after one year of the study.

H0.7. Nutrition education do not have any influence on nutritional knowledge, attitude, and practices among tribal girls.

H1.7. Nutrition education have significant influence on nutritional knowledge, attitude, and practices among tribal girls.

Null hypothesis (H0.7) and one alternative hypothesis was constructed prior to the study to evaluate the effect of nutrition education on the nutritional knowledge, attitude and practice of the selected tribal girls. ANOVA was tested among the variables to find out the influence. Results were explained in the following Tables 79, 80 and 81.

i. Nutrition related Knowledge of the selected tribal girls

Table 79 discussed about the nutrition related knowledge among the selected tribal girls

Table 79: Nutritional Knowledge Level

Knowledge on Nutrition	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
12-15 (Excellent)	-	-	-	-	6	45	-	-	-	-	3	43
8-11 (Very good)	7	7	8	4	37	5	1	1	2	2	33	7
4-7 (Fair)	12	13	10	16	7	-	19	17	18	13	14	-
0-3 (Poor)	31	30	30	30	-	-	30	32	30	35	-	-

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 79 revealed that majority (60 and 70 percent) of the selected tribal girls of the experiment groups of Aralam and Pulpally area attained very poor scores (0-3) before the study but after the one year 90 and 86 percent of the tribal girls of the same group secured excellent scores (12-15). It declared that the intervention programs intensively influenced the nutritional knowledge level of the tribal girls.

ii. Nutrition related attitude among the selected tribal girls

Table 80 deliberated about the nutrition related attitude of the selected tribal girls

Table 80: Attitude level on nutrition

Attitude on Nutrition	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
12-15 (Excellent)	-	-	-	-	20	41	-	-	-	-	23	46
8-11 (Very good)	7	8	7	10	17	6	9	9	8	8	15	4
4-7 (Fair)	11	11	10	10	9	3	14	13	12	11	8	-
0-3 (Poor)	32	31	33	30	4	-	27	28	30	31	4	-

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

The above table exposed that majority (60 and 62 percent) of the tribal girls from the experiment groups of Aralam and Pulpally area scored poor (0-3) before the study but after the one year 82 and 92 tribal girls of the same group scored excellent (12-15). It avowed that the intervention programs inclined the attitude level of the tribal girls in-depth.

iii. Nutrition related practices among the selected tribal girls

Table 81 revealed the nutrition related practices among the selected tribal girls.

Table 81: Nutrition related practices

Practice on Nutrition	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
12-15 (Excellent)	-	-	-	-	19	45	-	-	-	-	21	44
8-11 (Very good)	6	7	6	7	21	4	9	9	8	7	16	6
4-7 (poor)	8	7	7	13	10	1	10	11	10	9	11	-
0-3 (very poor)	36	36	36	30	-	-	31	30	32	34	2	-

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 80 proclaimed that the nutritional related practices among the tribal girls selected for the study was poor. Sixty and 68 percent of the selected tribal girls from the experimental group of Aralam and Pulpally scored poor (0-3) in the beginning of the study. After one year of intervention 90 percent in both groups scored excellent (12-15).

Table 82: One-way ANOVA for evaluating the effect of nutritional intervention on nutritional knowledge of the selected tribal girls

Knowledge on Nutrition	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12 M	Before	After6M	After12 M	Before	After6M	After12 M	Before	After6M	After12 M
Mean	3.96	3.76	3.8	4.06	10.8	13.6	3.92	4.0	3.5	3.7	10.1	13.8
SD	±3.5	±3.0	±3.2	±3.2	±3.4	±1.4	±3.2	±2.7	±2.8	±3.3	±2.7	±1.6
Pooled SD	3.23			2.84			2.89			2.64		
F Value (P Value)	0.05 (0.95)			148.7 (0.00)			0.39 (0.68)			188.00 (0.000)		

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 82 declared that there was a significant deviation at one percent level (p value 0.00) in the knowledge level of the both experimental groups whereas there was no significant changes in the knowledge level of the control group. It declared that the nutritional interventions significantly influence the nutritional knowledge of the tribal girls of experimental groups (Fig. 22).

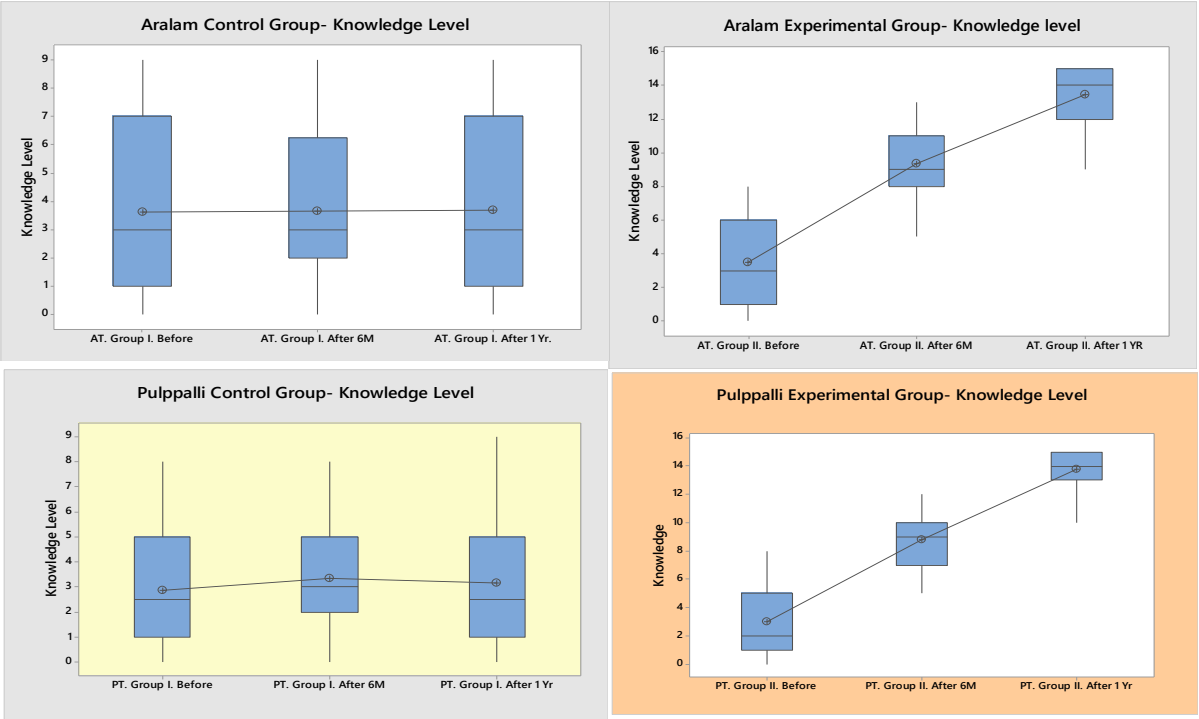

Figure. 22

Table 83: One-way ANOVA for evaluating the effect of nutrition intervention on nutritional attitude of the selected tribal girls

Attitude on Nutrition	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Average	3.62	3.66	3.68	3.46	9.38	13.5	2.88	3.34	3.16	2.98	8.78	13.8
SD	±2.9	±2.7	±2.9	±2.5	±2.0	±1.6	±2.1	±1.96	±2.4	±2.3	±1.9	±1.6
Pooled SD	2.86			2.05			2.17			1.91		
F Value (P Value)	0.01 (0.99)			300.38 (0.00)			0.57 (0.57)			403.88 (0.00)		

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 83 affirmed that there was a significant eccentricity at percent level (p value 0.00) in the attitude level of the both experimental groups whereas there was no significant changes in the attitude level of the control group. It declared that the nutritional interventions significantly influenced the nutritional attitude of the experimental groups (Fig.23).

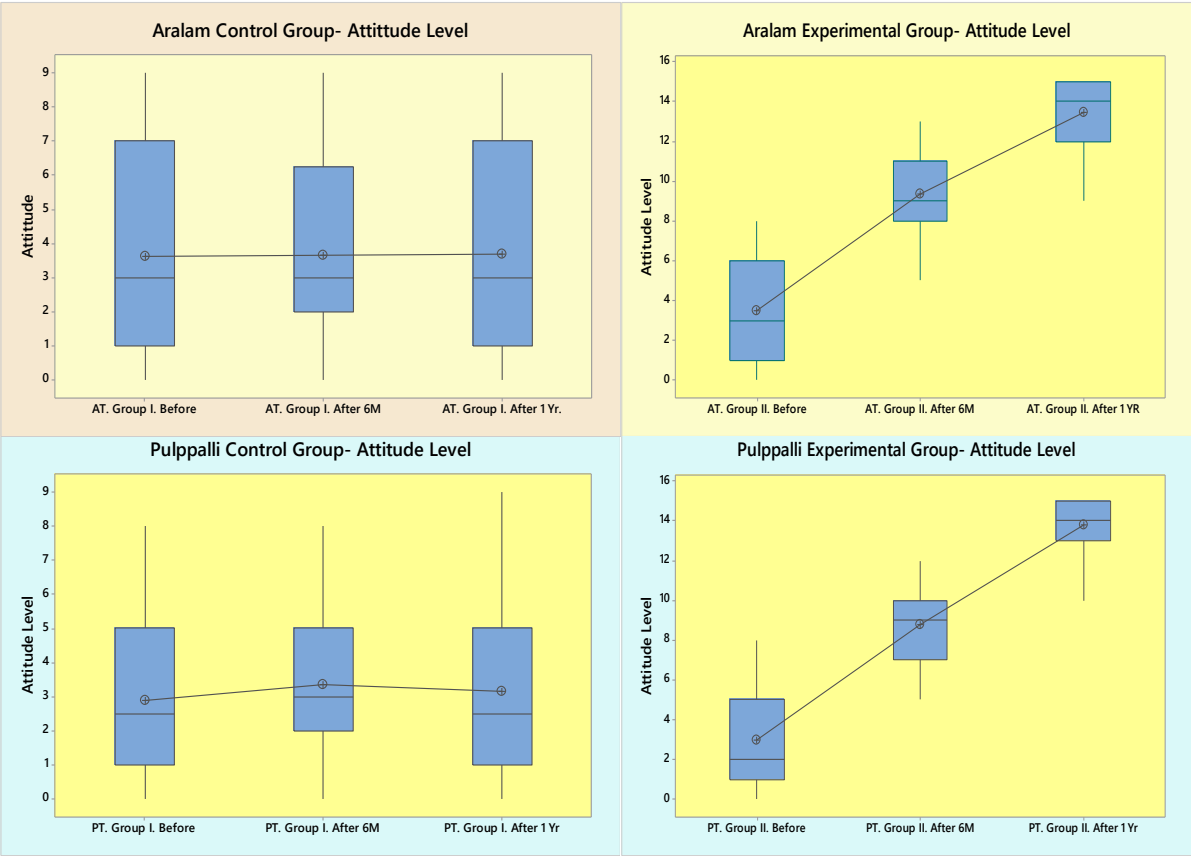

Figure. 23

Table 84: One-way ANOVA for evaluating the effect of intervention on nutritional practices among the selected tribal girls

Practice on Nutrition N=50	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Average	3.70	3.78	3.82	3.36	9.48	13.5	3.58	3.26	3.40	2.88	9.4	13.6
SD	±2.66	±2.60	±2.78	±2.21	±1.89	±1.55	±2.56	±2.41	±2.44	±2.20	±3.04	±1.69
Pooled SD	2.68			1.90			2.47			2.37		
F Value (P Value)	0.03 (0.974)			358.58 (0.00)			0.21 (0.81)			259.56 (0.00)		

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 84 declared that the selected tribal girls in the experimental group of tribal girls from both areas improved their nutritional practices and it statistically demonstrated at one percent level (p' value of 0.00). The deviations are illustrated in Figure 24.

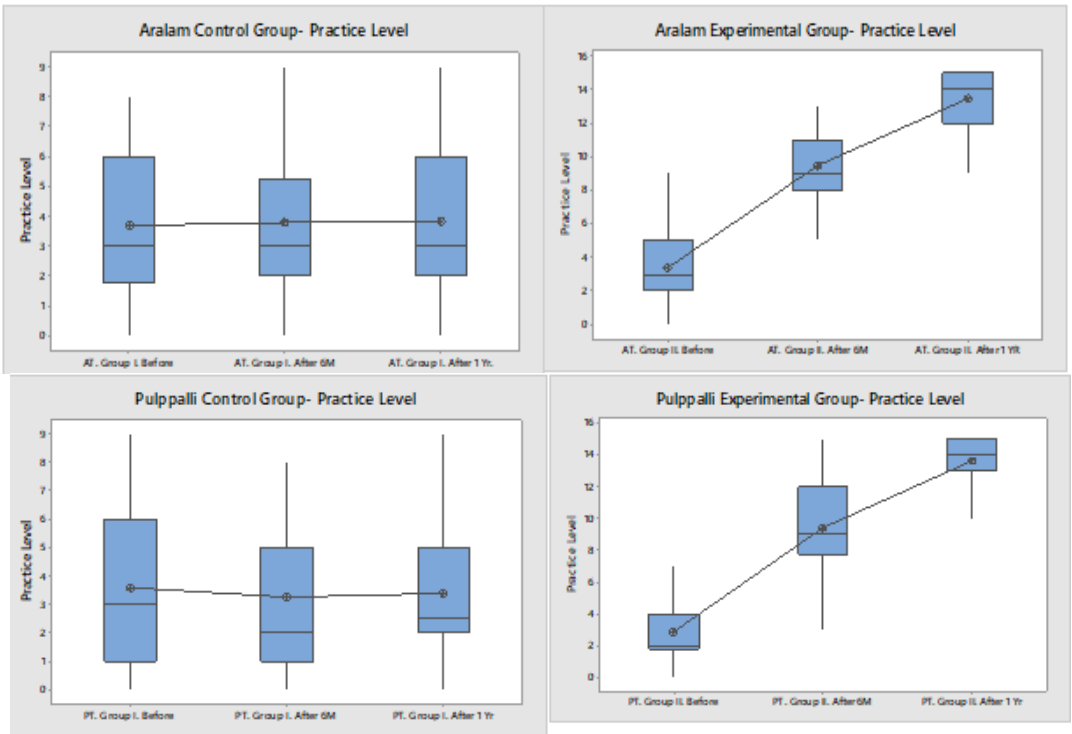

Figure. 24

Correlation between Knowledge, Attitude and Practice on nutritional aspects among the selected tribal girls

Table 85 described the correlation between Knowledge, Attitude and Practice on nutritional aspects among the selected tribal girls.

Table 85: Correlation between Knowledge, Attitude and Practice on nutritional aspects among the selected tribal girls

Correlation Variables	AT (Group I)		AT (Group II)		PT (Group I)		PT (Group II)	
	Pearson correlation	P value	Pearson correlation	P value	Pearson correlation	P value	Pearson correlation	P value
Knowledge and Attitude	0.945	0.000	0.750	0.000	0.834	0.000	0.805	0.000
Attitude and Practice	0.944	0.000	0.730	0.000	0.836	0.000	0.725	0.000
Knowledge and Practice	0.900	0.000	0.789	0.000	0.859	0.000	0.811	0.000

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe

Table 85 explained that there was a positive association at one percent level (p' value - 0.00) between the knowledge and attitude, attitude and practice, and knowledge and attitude. If the knowledge level increased it will be helped to improve the attitude and this will help to lead the healthy nutritional practices.

2. KAP on reproductive health

Knowledge, attitude and practices related to the reproductive health of the selected tribal girls were recorded prior to the study and the intervention programs regards to improve these factors conducted among the experimental group and chronicled after six months and after one year. The changes was documented.

H0.8. Menstrual hygiene education do not produce any effect on menstrual knowledge, attitude and practices among the selected tribal girls.

H1.8. Menstrual hygiene education significantly influence the menstrual knowledge, attitude and practices among the selected tribal girls.

Null hypothesis (H0.8) and alternative hypothesis was constructed to analyze the influence of intervention on the reproductive health knowledge, attitude and practices among the selected tribal girls. One-way ANOVA test was tested among the variables and the following tables designated about the variances.

i. Knowledge on reproductive health

Table 86 explained the knowledge related to reproductive health of the selected tribal girls.

Table 86: Knowledge on reproductive health among the selected tribal girls

Knowledge on reproductive health N=50	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
12-15 (Excellent)	-	-	-	-	16	43	-	-	-	-	17	44
8-11 (Very good)	2	1	1	-	13	6	-	-	-	-	12	6
4-7 (Fair)	9	10	15	11	10	1	16	15	15	15	13	-
0-3 (Poor)	39	39	34	39	11	-	34	35	35	35	8	-

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 86 described that 78 and 70 percent of selected tribal girls in the experimental group gained poor score (0-3). After one year intervention, 86 and 88 percent of them recorded excellent score (12-15). The control group did not have any noticeable change in their score.

ii. Attitude on reproductive health

Table 87 enlightened about the attitude on reproductive health among the selected tribal girls

Table 87: Attitude on reproductive health among the selected tribal girls

Attitude on reproductive health	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
12-15 (Excellent)	-	-	-	-	19	45	-	-	-	-	19	48
8-11 (Very good)	-	-	-	-	14	3	-	-	-	1	18	2
4-7 (Fair)	11	12	11	7	9	2	16	17	17	13	9	-
0-3 (Poor)	39	38	39	43	7	-	34	33	33	36	2	-

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 87 proclaimed that the reproductive health related attitude among the tribal area was poor. Eighty six and 72 percent of the selected tribal girls from the experimental group of Aralam and Pulpally scored poor (0-3) in the beginning of the study and 90 and 96 percent of them scored excellent (12-15) after one year of intervention.

iii. Practices on reproductive health

Table 88 enlightened about the attitude on reproductive health among the selected tribal girls

Table 88: Practices on reproductive health among the selected tribal girls

Practices during menstruation	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
12-15 (Excellent)	-	-	-	-	18	44	-	-	-	-	17	48
8-11 (Very good)	-	-	-	-	18	5	-	-	-	-	21	2
4-7 (poor)	10	11	12	13	11	1	14	15	15	11	12	0
0-3 (very poor)	40	39	38	37	3	-	36	35	35	39	-	-

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

The above table described that 74 and 78 percent of the experimental group tribal girls gained poor score (0-3) in their reproductive health practices. After one year intervention, 88 and 96 of them recorded excellent score (12-15). The control group did not have any perceptible change in their scores.

Table 89: One-way ANOVA for evaluatezing the effect of intervention on reproductive health knowledge among the selected tribal girls

Knowledge on reproductive health	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Average	2.42	2.56	3.10	2.04	8.12	13.56	2.50	2.74	3.28	2.52	10.00	13.56
SD	2.03	1.96	1.78	1.75	3.19	1.50	2.02	2.05	1.86	1.89	2.08	1.45
Pooled SD	1.93			2.27			1.98			1.82		
F Value (P Value)	1.74 (0.179)			322.24 (0.00)			2.04 (0.13)			477.43 (0.00)		

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 89 acknowledged that there was a significant changes at one percent level (p' value 0.00) in the knowledge level of the both experimental groups whereas there wasn't any significant changes in the knowledge level of the control group. It declared that the reproductive health intervention programs significantly influenced the knowledge of the experimental groups (Fig.25).

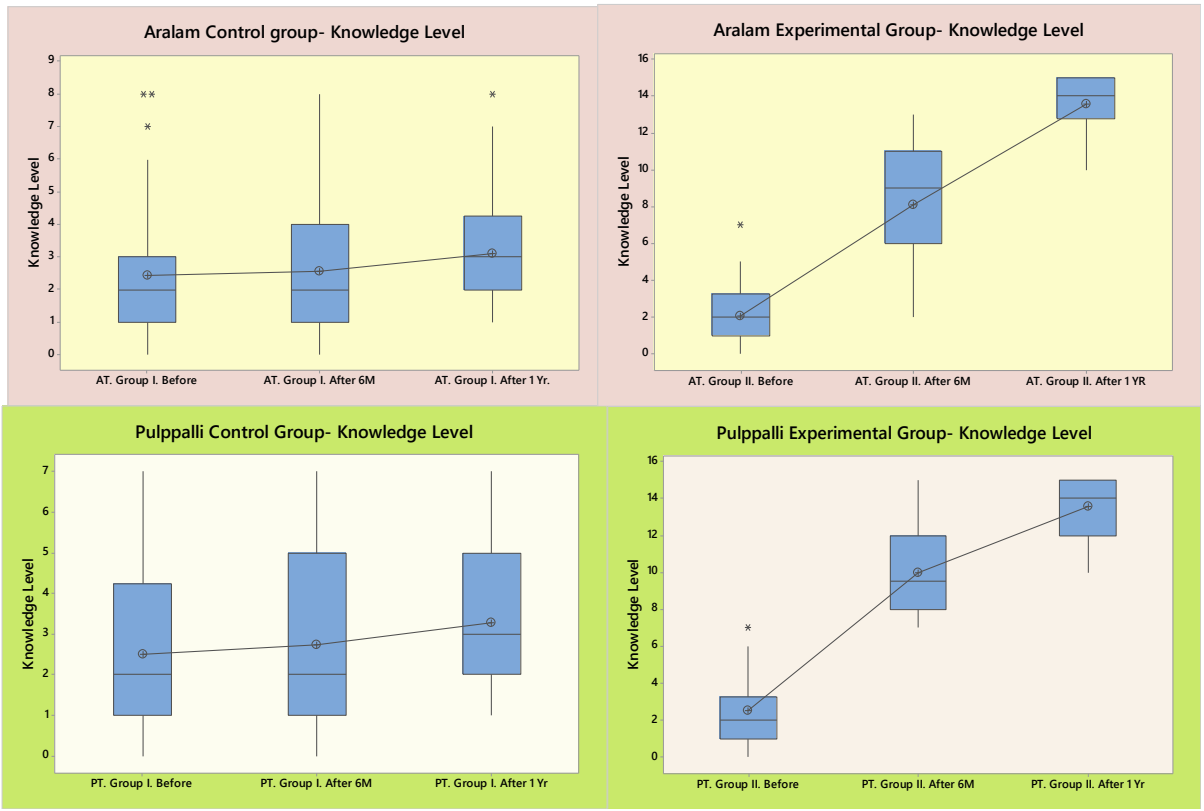

Figure.25

Table 90: One-way ANOVA for evaluating the effect of intervention on reproductive health attitude among the selected tribal girls

Attitude on reproductive health	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Average	2.46	2.78	3.06	3.36	9.48	13.5	2.24	2.58	2.58	1.84	8.50	13.44
SD	2.15	1.92	1.75	±2.21	±1.89	±1.55	1.65	1.34	1.46	1.57	3.25	1.99
Pooled SD	1.95			1.82			1.52			1.90		
F Value (P Value)	1.19 (0.31)			342.48 (0.00)			0.84 (0.43)			358.58 (0.00)		

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 90 affirmed that there was a significant eccentricity at one percent level (p' value 0.00) in the reproductive health attitude level of the both experimental groups whereas there were no significant changes in the attitude level of the control group. It confirmed that the nutritional interventions significantly influenced the nutritional attitude of the selected tribal girls in the experimental groups (Fig.26)

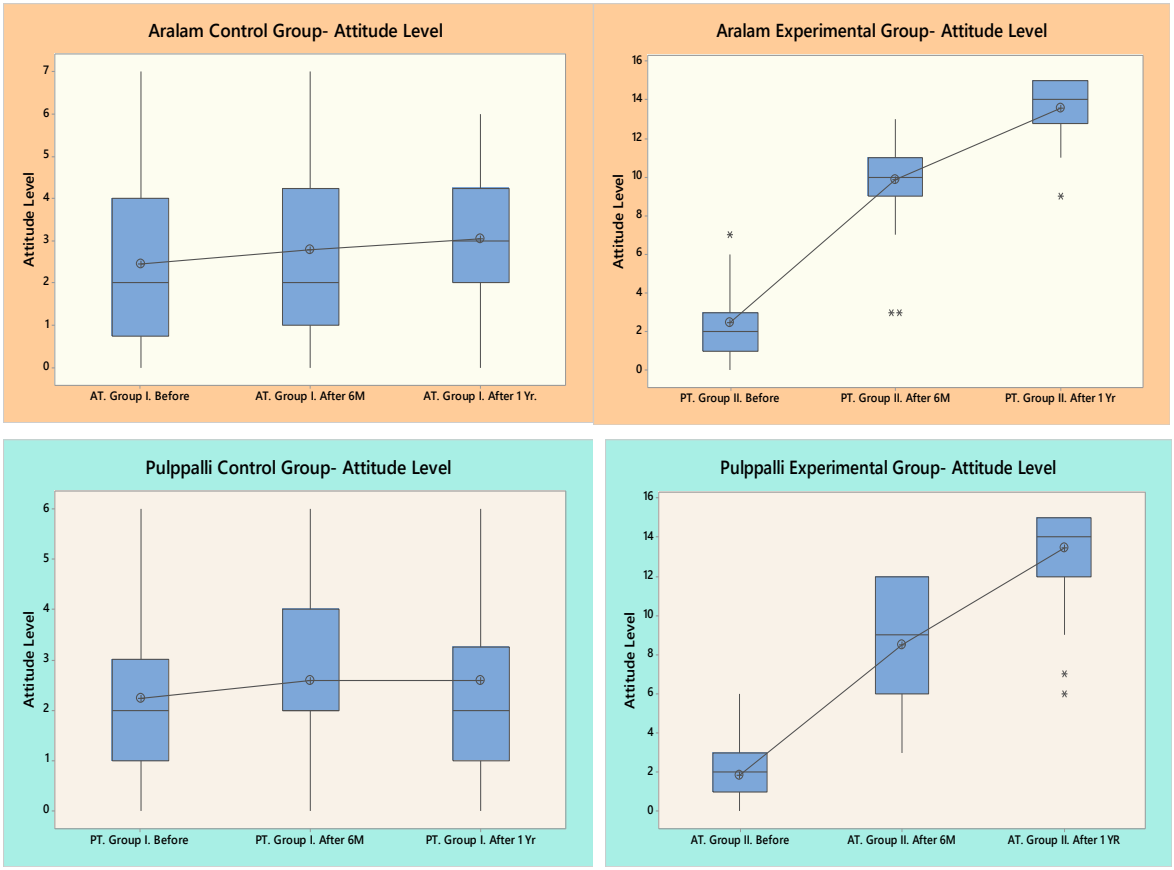

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Figure.26

Table 91: One-way ANOVA for evaluating the effect of intervention on reproductive health attitude among the selected tribal girls

Practice on reproductive health	A.T(Group I)			A.T (Group II)			P.T(Group I)			P.T (Group II)		
	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M	Before	After6M	After12M
Average	2.58	2.74	2.74	2.48	10.34	13.88	2.12	2.34	2.40	2.04	8.78	13.38
SD	1.76	1.69	1.60	1.69	1.92	1.26	1.61	1.39	1.43	1.73	2.64	1.78
Pooled SD	1.69			1.65			1.48			2.09		
F Value (P Value)	0.15 (0.86)			627.18 (0.00)			0.50 (0.61)			372.27 (0.00)		

Group I – Control, Group II- Experiment, A.T- Aralam Tribe, P.T- Pulpally Tribe, 6M- 6Months, 12M- 12 Months

Table 91 affirmed that there were significant changes in the both experimental group of tribal girls one percent level (p value 0.00) in their reproductive health practices after that intervention whereas control groups didn't notice any significant changes in their practice level.

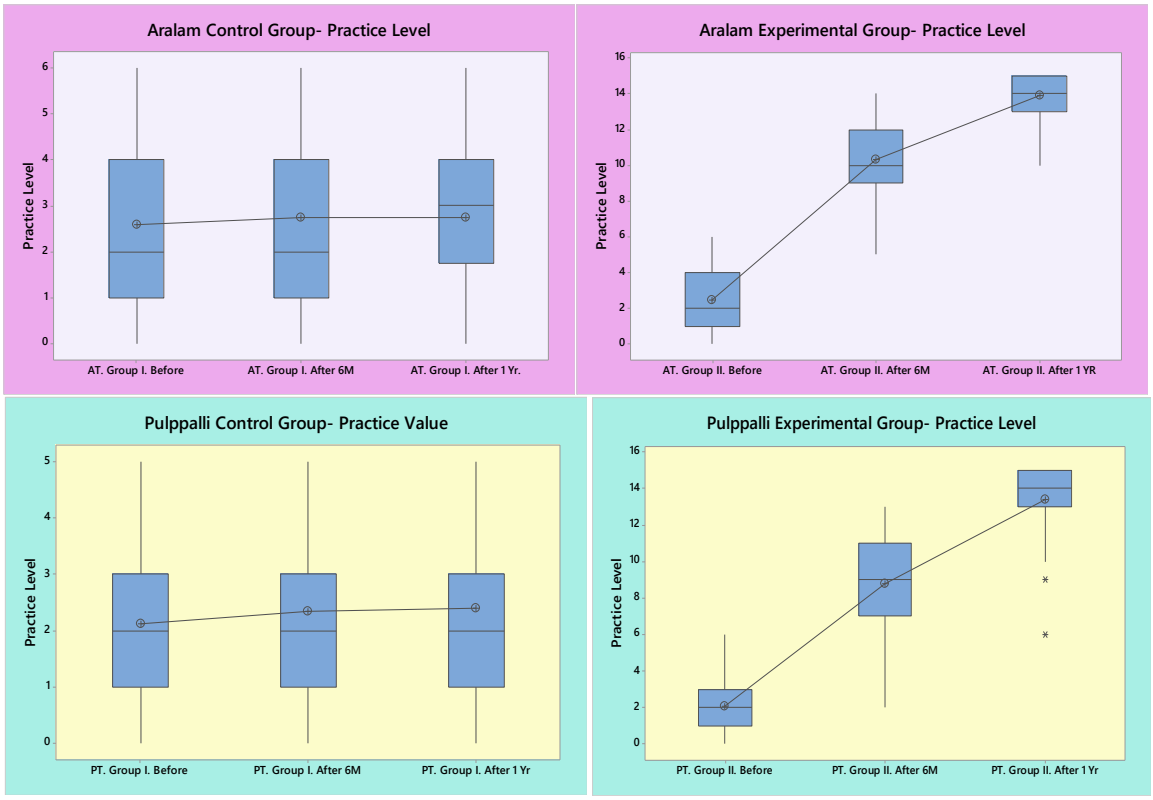

Figure. 27

Table 92: Correlation between Knowledge, Attitude and Practice on reproductive health among the selected tribal girls

Correlation Variables	AT (Group I)		AT (Group II)		PT (Group I)		PT (Group II)	
	Carl-Pearson correlation	P value	Carl-Pearson correlation	P value	Carl-Pearson correlation Value	P value	Carl-Pearson correlation Value	P value
Knowledge and Attitude	0.722	0.000	0.515	0.000	0.789	0.000	0.622	0.000
Attitude and Practice	0.686	0.000	0.522	0.000	0.806	0.000	0.530	0.000
Knowledge and Practice	0.636	0.000	0.419	0.002	0.833	0.000	0.533	0.000

The above table elucidated that there was a very positive correlation at one percent level (p value 0.00) between the knowledge and attitude, attitude and practice, and knowledge and attitude. It can explained that if the knowledge increase it will help to improve the attitude and this will help to lead a healthy practices as for their optimum health.

This chapter explicated about the socio-economical, nutritional and reproductive health facets of the selected tribal girls. It elaborated the influence of the nutritional and reproductive health interventions on the health and nutritional status of the selected tribal girls. According to the results consolidated, tribal girls suffered from economical, nutritional, and awareness deficit when compared to the nontribal counterparts. Even though the Aralam tribal girls exhibited an improved health status when compared to the Pulpally tribal girls, in the beginning of the study, tribal girls from Pulpally tribal area showed more affinity towards the intervention programs and they attained better health status and lifestyle pattern after one year of nutrition interventional study.

By conclusion, it emerges that the nutrition intervention strategies like raising nutrition garden along with nutrition education for its maintenance and usage of the products from the nutrition garden with proper knowledge related to nutritional significance and health benefits, has sustainability in terms of slow but sure possibility for improving the nutritional and health status of the tribal community. Though limited to a period of short duration, follow up over the period of one year revealed the nutrition garden coupled with nutrition education possibly has a strong association to promote the health status and prevent health problems.