

Hypertension and Diabetes in Women of Reproductive Age in a Rural, Forestry Hilly Region with Low Resources in Context of Consumption of Extra Salt and Mahua (*Madhuca longifolia*)-Pilot Study

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Abstract

Background: For healthy life, right food, life style are essential, specially for prevention of hypertension diabetes but challenges are many. Not much is known about rural, tribal women who live in extreme poverty.

Objective: Study was conducted to know about hypertension, diabetes amongst rural, tribal women in context of consumption of Mahua (*Madhuca longifolia*) and extra Salt.

Materials and Methods: Information about consumption of Mahua and extra salt was collected from rural tribal women of 20 to 49 years, randomly minimum 10 from each villages, 1200 study subjects in 100 villages. Blood pressure, blood sugar were estimated, if higher were confirmed at health facility.

Results: Of 1200 study subjects, 587 had Mahua trees in their backyards, 613 (51.1%) collected Mahua from outskirts, total 909 (75.8%) consumed Mahua, 5.4% as alcoholic beverage, 94.6% in other forms like roasted, boiled, as desert etc. 14.2% of them had hypertension, 11.6% diabetes. Of 291 who did not consume Mahua, 11.3% had hypertension, 7.9% diabetes. Of 49 who consumed Mahua as alcoholic beverage, 6.1% and of 860 who consumed Mahua in other forms 11.5% had hypertension, 4.0% of 49 and 10.5% of 860 had diabetes. Of 1200 subjects, 1082 (90.2%) had extra salt with meals, 11.6% had hypertension, 9.3% had diabetes. Of 118 who did not consume salt, 8.5% had hypertension, 6.8% diabetes.

Conclusion: Consumption of Mahua was more in other forms than alcoholic beverage. Hypertension and diabetes were more when Mahua was consumed in other forms. Many had hypertension and diabetes as Mahua was consumed with extra salt, probably the protective effect of Mahua was countered because of extra salt. Studies are needed.

Keywords: Women; Reproductive Age; Diabetes; Hypertension; Extra Salt; Mahua

Background

Around the globe many women of all ages are reported to be suffering from hypertension and/or diabetes which reduce their quality of life, impair ability to bear and nurture children, diminish the capacity for domestic and income generating work and affect future

health of their children too. Diabetes and hypertension have linkages to other non-communicable diseases (NCD), coronary artery disease (CAO) and stroke Al-Mawali [1]. So over all the effects on the health of women, family and society are immense. So, they are public health concerns. Gordon [2] reported that hypertension and diabetes which seemed largely a challenge for high-income nations, now are also being diagnosed in rural women commonly. Isara [3] also reported that rural women might be suffering from undiagnosed hypertension and diabetes. In low resource rural regions there may not be obesity but hypertension and diabetes may be due to other reasons not well known. *Madhuca longifolia* (Mahua) is a tropically grown tree in various parts of India, considered a boon by the tribals who are forest dwellers. Studies show that in animals, alcoholic extracts of Mahua produce beneficial effects on diabetic and lipid profile [4]. Mahua is utilized as a food ingredient for preparation of various food items and also alcoholic beverage [5]. The tribes consider Mahua tree and the Mahua drink as part of their cultural heritage. So, it is very necessary to know more about this and work on issues where there is possibility of prevention with real impact, continuity and sustainability. Not much is known about rural, tribal women who live in extreme poverty. Some people consume extra salt with their regular meals which has inbuilt salt and normally salt is also added during cooking. Salt is believed to be a direct risk factor for hypertension [6]. Whether beneficial effects of Mahua are countered because of salt it also not known. So, these two combinations need to be studied.

Objectives of the Study

Pilot study was done to know the relationship between consumption of Mahua and extra salt and Diabetes and Hypertension amongst rural tribal women of reproductive age.

Materials and Methods

After approval of ethics committee of the institute, which works on the principle of Declaration of Helsinki, the present study was conducted in tribal communities of 100 villages of forestry Melghat of Amravati of Maharashtra in Central India. These villages were around the village where a multispecialty health facility was created with thrust on mother and child care. In these 100 villages community based mother and child services were initiated. Hypertensive disorders seemed to be common during pregnancy and in elderly women too. So, it was decided to find out about diabetes and hypertension in nonpregnant women of reproductive age in relation of consumption of Mahua in different forms and consumption of extra salt. Information was collected by one to one interviews from minimum 10 women in each village by visiting every 10th house randomly and include women as per the criteria, nonpregnant women of 20 to 49 years. Some villages were small and others little bigger, so a total of 1200 women became study subjects. A pretested tool using language which women understood was used to get information about consumption of extra salt and Mahua in different forms and presence of diabetes and hypertension. Some questions needed yes or no answers and others were open ended for short answers. Information was recorded on the tool by the research assistant and no woman was given tool to fill. Blood pressure and blood sugar were estimated. Confirmation was done first by remeasurement of blood pressure and repeat estimation of blood sugar in villages and later at the base hospital for diagnosis of hypertension and diabetes. Consent was taken before inclusion in the study. Research assistant collected information by 5 days a week visits with one day for records completion.

Results

Of 1200 study subjects, 587 (48.9%) women had Mahua trees in their own backyards and 613 (51.1%) collected Mahua, from outskirts. Overall 909 (75.8%) of 1200 study subjects consumed Mahua. Total 129 (14.2%) had hypertension, and 105 (11.6%) had diabetes out of 909 women who consumed Mahua. Of 291 (24.3%) who did not consume Mahua, 33 (11.3%) had hypertension and 23 (7.9%) diabetes.

Of 1200 study subjects, 236 (19.6%) women were of 25-29 year, 194 (82.2%) of them consumed Mahua, 9 (4.6%) as alcoholic beverage, 53 (27.3%) had roasted Mahua, 53 (27.3%) boiled, 27 (13.9%) as desert, (Puranpoli, Chapati with cooked stuffed Mahua) and 52 (26.8%) consumed Mahua in other forms. Of these 194 women who consumed Mahua, 9 (4.6%) had hypertension and of 42 women who

did not consume Mahua, 3 (7.1%) had hypertension. Of 9 women who consumed Mahua as alcoholic beverage, one (11.1%) had hypertension, and 185 who consumed Mahua in others forms, 19 (10.2%) had hypertension. Of 194 women who consumed Mahua, 7 (3.6%) had diabetes and of 42 women who did not consume Mahua 2 (4.8%) had diabetes. Of 9 women who consumed Mahua as alcoholic beverage one (11.1%) had diabetes, and 185 who consumed Mahua in other forms, 15 (8.0%) had diabetes.

Of 1200 study subjects, 230 (19.6%) women were 45 - 49 years old and 165 (71.7%) of them consumed Mahua, 10 (6.1%) as alcoholic beverage, 155 (93.9%) in other forms. Of these 165 women who consumed Mahua, 46 (27.9%) had hypertension and of 65 women who did not consume Mahua, 10 (15.4%) had hypertension. Of 10 women who consumed Mahua as alcoholic beverage, 2 (20.0%) had hypertension, and 155 who consumed Mahua in others forms, 34 (21.9%) had hypertension. Of 165 women who consumed Mahua, 38 (23.0%) had diabetes and of 65 women who did not consume Mahua, 7 (10.8%) had diabetes. Of 10 women who consumed Mahua as alcoholic beverage, 2 (20.0%) had diabetes and 155 who consumed Mahua in other forms, 29 (18.7%) had diabetes.

Of 1200 study subjects, 435 (36.2%) women were illiterate, 396 (91.0%) of them consumed Mahua, 21 (5.4%) as alcoholic beverage, and 375 (94.6%) in other forms. Of those 396 women who consumed Mahua, 51 (12.9%) had hypertension and of 39 women who did not consume Mahua 8 (12.8%) had hypertension. Of 21 women who consumed Mahua as alcoholic beverage, 2 (9.5%) had hypertension, and 375 women who consumed Mahua in others forms, 51 (13.6%) had hypertension. Of 396 women who consumed Mahua, 47 (11.9%) had diabetes and of 39 women who did not consume Mahua, 3 (7.7%) had diabetes. Of 21 women who consumed Mahua as alcoholic beverage, one (4.7%) had diabetes and of 375 women who consumed Mahua in other forms, 43 (11.4%) had diabetes.

Of 1200 study subjects, 439 (36.5%) women were of lower economic class, 361 (82.2%) of them consumed Mahua, 16 (4.4%) as alcoholic beverage, and 345 (95.5%) in other forms. Of these 361 women who consumed Mahua, 47 (13.0%) had hypertension and of 78 women who did not consume Mahua, 14 (17.9%) had hypertension. Of 16 women who consumed Mahua as alcoholic beverage 2 (12.5%) had hypertension, and of 345 women who consumed Mahua in others forms, 49 (14.2%) had hypertension. Of 361 women who consumed Mahua, 38 (10.5%) had diabetes and of 78 women who did not consume Mahua, 10 (12.8%) had diabetes. Of 16 women who consumed Mahua as alcoholic beverage 1 (6.5%) had diabetes and 345 who consumed Mahua in other forms, 41 (11.8%) had diabetes.

Of 1200 study subjects, 378 (31.5%) women were housewives, 279 (73.8%) of them consumed Mahua, 5 (1.7%) as alcoholic beverage, and 274 (98.2%) in other forms. Of these 279 women who consumed Mahua, 39 (14.3%) had hypertension and of 99 women who did not consume Mahua, 10 (10.1%) had hypertension. Of 5 women who consumed Mahua as alcoholic beverage 1 (20.0%) had hypertension and 274 who consumed Mahua in other forms 49 (17.8%) had hypertension. Of 279 women who consumed Mahua, 29 (10.6%) had diabetes and of 99 women who did not consume Mahua, 6 (6.1%) had diabetes. Of 5 women who consumed Mahua as alcoholic beverage, one (20.0%) had diabetes and 274 who consumed Mahua in other forms 40 (14.5%) had diabetes.

Of 1200 study subjects, 532 were labourer and 176 (33.1%) of them had Mahua trees in their backyards but total 444 (83.5%) consumed Mahua, 40 (9.0%) as alcoholic beverage, and 404 (90.9%) in other forms. Of these 444 women who consumed Mahua, 69 (15.5%) had hypertension and of 88 women who did not consume Mahua, 11 (12.5%) had hypertension. Of 40 women who consumed Mahua as alcoholic beverage, 6 (15.0%) had hypertension, and 404 who consumed Mahua in others forms, 83 (20.5%) had hypertension. Of 444 women who consumed Mahua, 61 (13.7%) had diabetes and of 88 women who did not consume Mahua, 7 (8.0%) had diabetes. Of 40 women who consumed Mahua as alcoholic beverage, 5 (12.5%) had diabetes and 404 who consumed Mahua in other forms, 75 (18.5%) had diabetes.

Of 1200 study subjects, there was no woman without a child, 75 (6.2%) women had one child, 34 (45.3%) of them consumed Mahua, 6 (17.6%) as alcoholic beverage, and 28 (82.4%) in other forms. Of these 34 women who consumed Mahua, 4 (11.8%) had hypertension and of 41 women who did not consume Mahua, 5 (12.5%) had hypertension. Of 6 women who consumed Mahua as alcoholic beverage,

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one (16.6%) had hypertension, and of 28 women who consumed Mahua in others forms, 5 (17.8%) had hypertension. Of the 34 women who consumed Mahua 2 (5.9%) had diabetes. Of 41 women who did not consume Mahua one (2.4%) had diabetes and of 6 women who consumed Mahua as alcoholic beverage one (16.6%) had diabetes and 28 who consumed Mahua in other forms 4 (14.2%) had diabetes.

Overall, 272 (61.8%) of 440 women with five or more births had Mahua trees in their backyards. Total 371 (84.3%) women consumed Mahua, 13 (3.5%) as alcoholic beverage and 358 (96.4%) in other forms. Of these 371 women who consumed Mahua, 50 (13.5%) had hypertension and of 69 women who did not consume Mahua, 11 (15.9%) had hypertension and of 13 women who consumed Mahua as alcoholic beverage, 2 (15.3%) had hypertension and 358 who consumed Mahua in others forms, 75 (20.9%) had hypertension. Of 371 women who consumed Mahua, 41 (11.1%) had diabetes and of 69 women who did not consume Mahua 9 (13.0%) had diabetes. Of 13 women who consumed Mahua as alcoholic beverage, one (7.6%) had diabetes and 358 who consumed Mahua in other forms, 70 (19.5%) had diabetes (Table 1-3).

Variables	Total	Consumption				Mode									
		No	%	Yes	%	Alco- holic Bever- age	%	Roasted	%	Boiled	%	Desert	%	Other Forms	%
Age															
20 - 24	85	12	14.1	73	85.9	5	6.8	15	20.5	18	24.7	17	23.3	18	24.7
25 - 29	236	42	17.8	194	82.2	9	4.6	53	27.3	53	27.3	27	13.9	52	26.8
30 - 34	229	42	18.3	187	81.7	9	4.8	59	31.6	43	23.0	21	11.2	55	29.4
34 - 39	181	52	28.7	129	71.3	7	5.4	43	33.3	37	28.7	27	20.9	15	11.6
39 - 44	239	78	32.6	161	67.4	9	5.6	45	28.0	42	26.1	43	26.7	22	13.7
45 - 49	230	65	28.3	165	71.7	10	6.1	46	27.9	42	25.5	44	26.7	23	13.9
Total	1200	291	24.3	909	75.8	49	5.4	261	28.7	235	25.9	179	19.7	185	20.4
Education															
Illiterate	435	39	9.0	396	91.0	21	5.3	109	27.5	98	24.7	70	17.7	98	24.7
Primary	386	132	34.2	254	65.8	13	5.1	69	27.2	63	24.8	57	22.4	52	20.5
Secondary	230	70	30.4	160	69.6	9	5.6	52	32.5	49	30.6	32	20.0	18	11.3
Higher Secondary	95	26	27.4	69	72.6	4	5.8	20	29.0	18	26.1	15	21.7	12	17.4
Graduate	54	24	44.4	30	55.6	2	6.7	11	36.7	7	23.3	5	16.7	5	16.7
Total	1200	291	24.3	909	75.8	49	5.4	261	28.7	235	25.9	179	19.7	185	20.4
Economic status															
Upper	61	12	19.7	49	80.3	9	18.4	15	30.6	10	20.4	10	20.4	5	10.2
Upper Middle	56	32	57.1	24	42.9	2	8.3	7	29.2	7	29.2	5	20.8	3	12.5
Middle	256	75	29.3	181	70.7	10	5.5	50	27.6	49	27.1	49	27.1	23	12.7
Upper Lower	388	94	24.2	294	75.8	12	4.1	85	28.9	60	20.4	45	15.3	92	31.3
Lower	439	78	17.8	361	82.2	16	4.4	104	28.8	109	30.2	70	19.4	62	17.2
Total	1200	291	24.3	909	75.8	49	5.4	261	28.7	235	25.9	179	19.7	185	20.4

Profession															
Housewife	378	99	26.6	279	73.3	5	1.7	60	21.5	55	19.7	40	14.3	119	42.6
Laborers	532	88	16.5	444	83.5	40	9.0	175	39.4	105	23.6	105	23.6	19	4.3
Own farm laborers	290	104	35.1	186	65.5	04	2.1	26	13.9	75	40.3	34	18.2	47	25.2
Total	1200	291	24.3	909	75.8	49	5.4	261	28.7	235	25.9	179	19.7	185	20.4
Parity															
P1	75	41	54.7	34	45.3	6	17.6	10	29.4	7	20.6	6	17.6	5	14.7
P2	95	56	58.9	39	41.1	8	20.5	10	25.6	9	23.1	8	20.5	4	10.3
P3	265	74	27.9	191	72.1	10	5.2	55	28.8	69	36.1	51	26.7	6	3.1
P4	325	51	15.7	274	84.3	12	4.4	63	23.0	72	26.3	57	20.8	70	25.5
P5 Above	440	69	15.7	371	84.3	13	3.5	123	33.2	78	21.0	57	15.4	100	27.0
Total	1200	291	24.3	909	75.8	49	5.4	261	28.7	235	25.9	179	19.7	185	20.4

Table 1: Consumption of mahua in different modes.

Variable	Total	Consumption of Mahua							
		Hypertension				Diabetes			
		Yes	%	No	%	Yes	%	No	%
Age									
20 - 24	73	5	6.8	68	93.2	3	4.1	70	95.9
25 - 29	194	9	4.6	185	95.4	7	3.6	187	96.4
30 - 34	187	11	5.9	176	94.1	9	4.8	178	95.2
34 - 39	129	17	13.2	112	86.8	15	11.6	114	88.4
39 - 44	161	41	25.5	120	74.5	33	20.5	128	79.5
45 - 49	165	46	27.9	119	72.1	38	23.0	127	77.0
Total	909	129	14.2	780	85.8	105	11.6	804	88.4
Education									
Illiterate	396	51	12.9	345	87.1	47	11.9	349	88.1
Primary	254	41	16.1	213	83.9	36	14.2	218	85.8
Secondary	160	20	12.5	140	87.5	11	6.9	149	93.1
Higher Secondary	69	15	21.7	54	78.3	9	13.0	60	87.0
Graduate	30	2	6.7	28	93.3	2	6.7	28	93.3
Total	909	129	14.2	780	85.8	105	11.6	804	88.4
Economics									
Upper	49	9	18.4	40	81.6	5	10.2	44	89.8
Upper Middle	24	5	20.8	19	79.2	3	12.5	21	87.5

Middle	181	29	16.0	152	84.0	23	12.7	158	87.3
Upper Lower	294	39	13.3	255	86.7	36	12.2	258	87.8
Lower	361	47	13.0	314	87.0	38	10.5	323	89.5
Total	909	129	14.2	780	85.8	105	11.6	804	88.4
Profes- sion									
Housewife	279	39	14.3	240	86.0	29	10.6	250	89.6
Laborers	444	69	15.5	375	84.5	61	13.7	383	86.3
Own farm laborers	186	21	10.9	165	88.7	15	7.8	171	91.9
Total	909	129	14.2	780	85.8	105	11.6	804	88.4
Parity									
P1	34	4	11.8	30	88.2	2	5.9	32	94.1
P2	39	7	17.9	32	82.1	5	12.8	34	87.2
P3	191	30	15.7	161	84.3	24	12.6	167	87.4
P4	274	38	13.9	236	86.1	33	12.0	241	88.0
P5 Above	371	50	13.5	321	86.5	41	11.1	330	88.9
Total	909	129	14.2	780	85.8	105	11.6	804	88.4

Table 2: Consumption of mahua and hypertension and diabetes.

Variable	Total	Hypertension				Diabetes			
		Yes	%	No	%	Yes	%	No	%
Age									
20 - 24	12	1	8.3	11	91.7	1	8.3	11	91.7
25 - 29	42	3	7.1	39	92.9	2	4.8	40	95.2
30 - 34	42	4	9.5	38	90.5	3	7.1	39	92.9
34 - 39	52	7	13.5	45	86.5	5	9.6	47	90.4
39 - 44	78	8	10.3	70	89.7	5	6.4	73	93.6
45 - 49	65	10	15.4	55	84.6	7	10.8	58	89.2
Total	291	33	11.3	258	88.7	23	7.9	268	92.1
Education									
Illiterate	39	5	12.8	34	87.2	3	7.7	36	92.3
Primary	132	21	15.9	111	84.1	16	12.1	116	87.9
Secondary	70	3	4.3	67	95.7	2	2.9	68	97.1
Higher Secondary	26	2	7.7	24	92.3	1	3.8	25	96.2
Graduate	24	2	8.3	22	91.7	1	4.2	23	95.8
Total	291	33	11.3	258	88.7	23	7.9	268	92.1
Economics									
Upper	12	3	25.0	9	75.0	1	8.3	11	91.7

Upper Middle	32	4	12.5	28	87.5	2	6.3	30	93.8
Middle	75	6	8.0	69	92.0	5	6.7	70	93.3
Upper Lower	94	6	6.4	88	93.6	5	5.3	89	94.7
Lower	78	14	17.9	64	82.1	10	12.8	68	87.2
Total	291	33	11.3	258	88.7	23	7.9	268	92.1
Profession									
Housewife	99	10	10.1	89	89.9	6	6.1	93	93.9
Laborers	88	11	12.5	77	87.5	7	8.0	81	92.0
Own farm laborers	104	12	11.5	92	88.5	10	9.6	94	90.4
Total	291	33	11.3	258	88.7	23	7.9	268	92.1
Parity									
P1	41	5	12.2	36	87.8	1	2.4	40	97.6
P2	56	5	8.9	51	91.1	3	5.4	53	94.6
P3	74	5	6.8	69	93.2	4	5.4	70	94.6
P4	51	7	13.7	44	86.3	5	9.8	46	90.2
P5 Above	69	11	15.9	58	84.1	9	13.0	60	87.0
Total	291	33	11.3	258	88.7	22	7.6	269	92.4

Table 3: No mahua and hypertension and diabetes.

Of 1200 study subjects, 1082 (90.2%) women used to consume extra salt with meals, 157 (14.5%) had salt with chillies, 393 (36.3%) had salt with oil and 532 (49.2%) used to put extra salt on cooked vegetables which had inherent salt and salt was added during cooking too. Of these 1082 women who consumed extra salt, 126 (11.6%) had hypertension and of 118 women who did not consume extra salt, 10 (8.5%) had hypertension (p value 0.2609). Of 1082 women who consumed extra salt, 101 (9.3%) had diabetes and of 118 women who did not consume extra salt 8 (6.8%) had diabetes. Of 1200 study subjects, 230 (19.1%) were of 45 - 49 year, 207 (90.0%) women used to have extra salt in various forms. Of these 207 women who consumed extra salt 45 (21.7%) had hypertension and of 23 women who did not consume extra salt 4 (17.4%) had hypertension and 207 women who consumed extra salt, 35 (16.9%) had diabetes and of 23 women who did not consume extra salt, 3 (13.0%) had diabetes and 28 (87.0%) did not have diabetes. Of 1200 study subjects, 435 (36.2%) were illiterate, 412 (94.7%) women used to have extra salt in various forms with meals. Of these 412 women who consumed extra salt, 49 (11.9%) had hypertension and 23 women who did not consume extra salt, 5 (21.7%) had hypertension. Of 412 women who consumed extra salt, 44 (10.7%) had diabetes and of 23 women who did not consume extra salt, 3 (13.0%) had diabetes and 20 (87.0%) did not have diabetes.

Of 1200 study subjects, 388 (32.3%) were from upper lower economic, and 356 (91.8%) women used to have extra salt by various modalities. Of these 356 women who consumed extra salt 38 (10.7%) had hypertension, 34 (9.6%) had diabetes and of 32 women who did not consume extra salt 2 (6.3%) had hypertension and 2 (6.3%) had diabetes.

Of 1200 study subjects, 439 (36.2%) were of lower economic class, and 427 (97.3%) women used to have extra salt with meals in various forms. Of these 427 women who consumed extra salt, 45 (10.5%) had hypertension, 36 (8.4%) had diabetes and of 12 women who did not consume extra salt, 5 (41.0%) had hypertension and 2 (16.7%) had diabetes.

Of 1200 study subjects, 532 (44.3%) were labourer and 497 (93.4%) women used to have extra salt with meals in various forms. Of these 497 women who consumed extra salt, 67 (13.5%) had hypertension, 59 (11.9%) had diabetes and of 35 women who did not consume extra salt, 7 (20.0%) had hypertension and 3 (8.6%) had diabetes.

Of 1200 study subjects, 440 (36.6%) with five or more births, and 421 (95.7%) women used to have extra salt with meals in various forms. Of these 421 women who consumed extra salt 49 (11.6%) had hypertension, 39 (9.3%) had diabetes and of 19 women who did not consume extra salt 5 (26.3%) had hypertension and 3 (15.8%) had diabetes (Table 4-6).

Variables	Total	Extra Salt				Mode					
		No	%	Yes	%	With Chil-lies	%	With Oil	%	On Vegeta-bles	%
Age											
20 - 24	85	12	14.1	73	85.9	35	47.9	21	28.8	17	23.3
25 - 29	236	24	10.2	212	89.8	13	6.1	165	77.8	34	16.0
30 - 34	229	18	7.9	211	92.1	23	10.9	109	51.7	79	37.4
34 - 39	181	9	5.0	172	95.0	35	20.3	24	14.0	113	65.7
39 - 44	239	32	13.4	207	86.6	35	16.9	46	22.2	126	60.9
45 - 49	230	23	10.0	207	90.0	16	7.7	28	13.5	163	78.7
Total	1200	118	9.8	1082	90.2	157	14.5	393	36.3	532	49.2
Education											
Illiterate	435	23	5.3	412	94.7	35	8.5	175	42.5	202	49.0
Primary	386	34	8.8	352	91.2	35	9.9	135	38.4	182	51.7
Secondary	230	42	18.3	188	81.7	35	18.6	41	21.8	112	59.6
Higher Secondary	95	11	11.6	84	88.4	44	52.4	29	34.5	11	13.1
Graduate	54	8	14.8	46	85.2	8	17.4	13	28.3	25	54.3
Total	1200	118	9.8	1082	90.2	157	14.5	393	36.3	532	49.2
Economic											
Upper	61	31	50.8	30	49.2	12	40.0	9	30.0	9	30.0
Upper Middle	56	19	33.9	37	66.1	12	32.4	6	16.2	19	51.4
Middle	256	24	9.4	232	90.6	54	23.3	98	42.2	80	34.5
Upper Lower	388	32	8.2	356	91.8	47	13.2	147	41.3	162	45.5
Lower	439	12	2.7	427	97.3	32	7.5	136	31.9	259	60.7
Total	1200	118	9.8	1082	90.2	157	14.5	393	36.3	532	49.2
Profession											
Housewife	375	46	12.3	329	87.7	76	23.1	116	35.3	137	41.6
Labourer	532	35	6.6	497	93.4	69	13.9	168	33.8	260	52.3
Own farm labourer	293	37	12.6	256	87.4	12	4.7	109	42.6	135	52.7
Total	1200	118	9.8	1082	90.2	157	14.5	393	36.3	532	49.2
Parity											
P1	75	32	42.7	43	57.3	15	34.9	17	39.5	11	25.6
P2	95	23	24.2	72	75.8	24	33.3	35	48.6	13	18.1
P3	265	28	10.6	237	89.4	69	29.1	75	31.6	93	39.2
P4	325	16	4.9	309	95.1	25	8.1	121	39.2	163	52.8
P5 Above	440	19	4.3	421	95.7	24	5.7	145	34.4	252	59.9
Total	1200	118	9.8	1082	90.2	157	14.5	393	36.3	532	49.2

Table 4: Consumption of extra salt.

Variable	Total	Consumption of Extra Salt Yes							
		Hypertension				Diabetes			
		Yes	%	No	%	Yes	%	No	%
Age									
20 - 24	73	5	6.8	68	93.2	3	4.1	70	95.9
25 - 29	212	9	4.2	203	95.8	7	3.3	205	96.7
30 - 34	211	11	5.2	200	94.8	9	4.3	202	95.7
34 - 39	172	17	9.9	155	90.1	15	8.7	157	91.3
39 - 44	207	39	18.8	168	81.2	32	15.5	175	84.5
45 - 49	207	45	21.7	162	78.3	35	16.9	172	83.1
Total	1082	126	11.6	956	88.4	101	9.3	981	90.7
Education									
Illiterate	412	49	11.9	363	88.1	44	10.7	368	89.3
Primary	352	40	11.4	312	88.6	35	9.9	317	90.1
Secondary	188	20	10.6	168	89.4	11	5.9	177	94.1
Higher Secondary	84	15	17.9	69	82.1	9	10.7	75	89.3
Graduate	46	2	4.3	44	95.7	2	4.3	44	95.7
Total	1082	126	11.6	956	88.4	101	9.3	981	90.7
Economics									
Upper	30	9	30.0	21	70.0	5	16.7	25	83.3
Upper Middle	37	5	13.5	32	86.5	3	8.1	34	91.9
Middle	232	29	12.5	203	87.5	23	9.9	209	90.1
Upper Lower	356	38	10.7	318	89.3	34	9.6	322	90.4
Lower	427	45	10.5	382	89.5	36	8.4	391	91.6
Total	1082	126	11.6	956	88.4	101	9.3	981	90.7
Profession									
Housewife	329	38	11.6	291	88.4	27	8.2	302	91.8
Laborers	497	67	13.5	430	86.5	59	11.9	438	88.1
Own farm laborers	256	21	8.2	235	91.8	15	5.9	241	94.1
Total	1082	126	11.6	956	88.4	101	9.3	981	90.7
Parity									
P1	43	4	9.3	39	90.7	2	4.7	41	95.3
P2	72	7	9.7	65	90.3	5	6.9	67	93.1
P3	237	30	12.7	207	87.3	24	10.1	213	89.9
P4	309	36	11.7	273	88.3	31	10.0	278	90.0
P5 Above	421	49	11.6	372	88.4	39	9.3	382	90.7
Total	1082	126	11.6	956	88.4	101	9.3	981	90.7

Table 5: Extra salt and hypertension and diabetes.

Variable	Total	Hypertension				Diabetes			
		Yes	%	No	%	Yes	%	No	%
20 - 24	12	1	8.3	11	91.7	1	8.3	11	91.7
25 - 29	24	1	4.2	23	95.8	1	4.2	23	95.8
30 - 34	18	1	5.6	17	94.4	1	5.6	17	94.4
34 - 39	9	1	11.1	8	88.9	1	11.1	8	88.9
39 - 44	32	2	6.3	30	93.8	1	3.1	31	96.9
45 - 49	23	4	17.4	19	82.6	3	13.0	20	87.0
Total	118	10	8.5	108	91.5	8	6.8	110	93.2
Education									
Illiterate	23	5	21.7	18	78.3	3	13.0	20	87.0
Primary	34	2	5.9	32	94.1	2	5.9	32	94.1
Secondary	42	1	2.4	41	97.6	1	2.4	41	97.6
Higher Secondary	11	1	9.1	10	90.9	1	9.1	10	90.9
Graduate	8	1	12.5	7	87.5	1	12.5	7	87.5
Total	118	10	8.5	108	91.5	8	6.8	110	93.2
Economics									
Upper	31	1	3.2	30	96.8	1	3.2	30	96.8
Upper Middle	19	1	5.3	18	94.7	1	5.3	18	94.7
Middle	24	1	4.2	23	95.8	2	8.3	22	91.7
Upper Lower	32	2	6.3	30	93.8	2	6.3	30	93.8
Lower	12	5	41.7	7	58.3	2	16.7	10	83.3
Total	118	10	8.5	108	91.5	8	6.8	110	93.2
Profession									
Housewife	46	1	2.2	45	97.8	2	4.3	44	95.7
Laborers	35	7	20.0	28	80.0	3	8.6	32	91.4
Own farm laborers	37	2	5.4	35	94.6	3	8.1	34	91.9
Total	118	10	8.5	108	91.5	8	6.8	110	93.2
Parity									
P1	32	1	3.1	31	96.9	1	3.1	31	96.9
P2	23	1	4.3	22	95.7	1	4.3	22	95.7
P3	28	1	3.6	27	96.4	1	3.6	27	96.4
P4	16	2	12.5	14	87.5	2	12.5	14	87.5
P5 Above	19	5	26.3	14	73.7	3	15.8	16	84.2
Total	118	10	8.5	108	91.5	8	6.8	110	93.2

Table 6: No extra salt and hypertension and diabetes.

Discussion

Living a healthy, productive life requires individuals, families and communities need to embrace behaviour, which promote health and wellbeing. Despite increasing recognition of behavioural effects on health and increasing availability of products and services that address common health challenges, adoption of both behaviour and solutions have often been slow [7]. Solutions need to involve understanding of the issues of everyday life. There may be gaps in knowledge or gaps in use. Arlappa [8] reported that the prevalence of hypertension was higher among tribal adult population of Kerala in India and it had relation to age, gender, education, health and human service wealth index, physical inactivity, alcohol, overweight and obesity. Namrata [9] reported that knowledge, awareness about hypertension in women was low though the prevalence was high and their life style practices grossly contributed to it. Therefore, efforts are needed to gear towards improving the levels of awareness of the women regarding hypertension and diabetes and the risk factors. During community based mother and child services it was found that at though there was no obesity but hypertension was common in elderly also, in addition to pregnant women. It was decided to know about hypertension and diabetes in rural tribal women who lived in extreme poverty.

Of 1200 study subjects, 587 (48.9%) women had Mahua trees in their backyards, 613 (51.1%) collected Mahua from outskirts, and 909 (75.8%) consumed Mahua, 49 (5.4%) as alcoholic beverage, 860 (94.6%) in other forms like roasted, boiled, desert and so on. Of 909 women 129 (14.2%) had hypertension and of 291 who did not consume Mahua, 33 (11.3%) had hypertension and of 49 who consumed Mahua as alcoholic beverage 3 (6.1%) had hypertension, 860 who consumed Mahua in others forms 99 (11.5%) had hypertension. Of 909 women who consumed Mahua, 105 (11.6%) had diabetes and of 291 women who did not consume Mahua, 23 (7.9%) had diabetes. Of 49 who consumed Mahua as alcoholic beverage 2 (4.0%) had diabetes, 860 who consumed Mahua in other forms 91 (10.5%) had diabetes. Having own tree makes availability of Mahua easy so every day use is easy.

Datta [4] did a study to know whether regular consumption of *Madhuca longifolia* drinks affected the local communities as many used it and reported that regular Mahua as alcohol beverage did improve diabetes and lipid profile, except triglycerides and VLDL in males. Researchers suggested that more elaborated studies were needed to have proper insight and practical gains in this regard. Shirao [10] did a study about hypolipidemic activity of *Madhuca longifolia* in triton induced hyperlipidemic rats and reported that treatment with ML lowered the level of serum cholesterol, triglyceride phospholipids. In addition, ML reduced oxidative stress and normalized the activities of Superoxide Dismutase (SOD), Catalase (CAT), Glutathione Peroxidase (GPx) and Glutathione Reductase (GRh). Study provided strong evidence that intragastric administration of ML had a beneficial effect in treating dyslipidemia with decrease in oxidative stress. Bisht [5] reported that other than meeting food and other requirements, Mahua was also an important source of seasonal income. Its flowers are used to have country brewed liquor which was very popular in the tribal communities as was in the present study. Present study was done to sensitize the communities to help themselves by doing the doable in the existing system. Intention was also to provide information to the public system for required services in a better way through the existing network. Advocacy needs to be in local context. It is being believed that because much of the world's population is inadequately nourished and many environmental systems and processes are pushed beyond safe boundaries by food production, global transformation of the food available and food consumed is urgently needed. The same was with the women of the communities with extreme poverty. Actually Mahua used to be consumed when these communities did not have anything to eat and did not have any resources, specially during rains when they were cut from other villages. Problems increased and villagers continued to consume with their beliefs whether there was science was not clear. Patel [11] reported that Mahua provided several medicinal and non-medicinal products, which were vital for the health and wealth point of view of tribals. Mahua is an Indian original plant which has several undiscovered properties like anti-inflammatory effect also. However in the present study it was revealed that a lot of salt was used when villagers did not have anything to go with Roti or Rice and it became their habit which continues. Poverty is also persisting. The present study was to know whether these two items consumed affected occurrence of Hypertension and Diabetes. Studies are needed about what happens when Mahua and extra salt, both are consumed. Agrawal [12] reported that maternal mortality was on rise in U.S. and leading cause of maternal deaths in U.S. was reported to be cardiovascular disease because chronic conditions like

obesity, high blood pressure and diabetes were increasing. So, such problems are global. Singh [13] did a study of 400 women in the reproductive age and reported 23.5% prevalence of hypertension. Extra salt intake, family history and underlying medical conditions were the major risk factors. Azeez [14] reported that in their study to know the prevalence of hypertension and diabetes in non-pregnant women of reproductive age in the United States, the estimated prevalence of hypertension was 9.3% overall. Among women with diabetes, almost 30% had undiagnosed diabetes. In the present study of 1200 study subjects, 1082 (90.2%) women used to have extra salt with meals, in various ways and of them 126 (11.6%) had hypertension and of 118 women who did not consume extra salt 10 (8.5%) had hypertension (p value 0.2609). Of 1082 women who consumed extra salt 101 (9.3%) had diabetes and of 118 women who did not consume extra salt 8 (6.8%) had diabetes. Mishra [15] reported that the bark of Mahua was used for rheumatism, chronic bronchitis, diabetes mellitus and other diseases. Bark decoction has been proven to be effective for cure of diabetes. Ruel [16] reported that convincing people to take simple steps for their own health, encouraging healthy behaviour is not straight forward. It is essential to understand the realities, know gaps and work on them. Li [17] reported that one of the major challenges of nutrition related advocacy, and lifestyle modifications was that it was difficult to achieve and maintain in the long-term, once initial changes were made. Zuccala [18] reported that the landmark 2005 WHO report, about preventing chronic diseases to reduce premature deaths from NCDs by a third and promote mental health and wellbeing. In UN General Assembly 66th Session [19] inclusion of NCDs in the Sustainable Development Goals (SDG) in 2016 was to reduce premature mortality from diabetes and hypertension by a third by 2030 but, despite an increasingly well organised civil society response, despite an increasingly well organised civil society response, NCDs have not broken through into the mainstream of development and global health. Adjaye-Gbewonyo [20] reported that when diabetes and hypertension were viewed as lifestyle conditions, attention was paid to individual behaviours rather than to wider social and commercial determinants of health. UN Human Rights Council 44th Session [21] reported that NCDs accounted for more than a third of the burden of disease among the world's poorest people, including almost 8 lac deaths annually among those younger than 40 years. Diabetes and hypertension must be viewed not only as diseases of affluent but also as diseases of poverty and linkages to their food habits and life styles need to be studied. Ramadan [22] reported that Mahua seeds gave significant yield of fat where in the fat a source of essential fatty acids and lipid soluble to bioactives. It appears that well designed studies are needed to understand the effects of Mahua in various forms and extra salt in different age groups on diabetes and hypertension are global problems.

Limitations of Study

Before study numbers of consumers of Mahua, extra salt were not known. Mahua and extra salt use turned to be by many. So, there is big difference in users and nonusers. More, better designed case control studies are needed.

Conclusion

Consumption of Mahua was more in other forms than alcoholic beverage. Hypertension and diabetes were more when Mahua was consumed in other forms. Many had hypertension and diabetes as Mahua was consumed with extra salt, probably the protective effect of Mahua was countered because of extra salt. It appears that well designed studies are needed to understand the effects of Mahua in various forms and extra salt in different age groups on diabetes and hypertension are global problems.

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