

## Nutrition education - a strategy to manage urolithiasis

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**Abstract:** Kidney stone disease is among the most painful and prevalent urological disorders. This disease is related to diet and lifestyle pattern of an individual. A study was carried out to develop nutrition education material and to know its impact on knowledge and practices of stone patients. About 30 selected kidney stone patients and equal number of age and gender matched controls were selected for education intervention. Nutrition education was given on different aspects of kidney stones and its management, through power point presentations, flash cards and booklet. Knowledge and practices were assessed before and after the intervention, which lasted for two months. The results of the study revealed that, higher percentage of renal stone patients belonged to the overweight and obese grade I category compared to control subjects (over weight 46.67% vs 30%, obese grade I 26.67% vs 6.67%). Only few subjects in control group belonged to the obese grade II category (6.67%). Half the subjects in both the groups had normal WHR (56.67% and 53.33% respectively). Majority of subjects had no family history of stone disease in both the groups (63%). Maximum patients in both the groups had low knowledge scores about the disorder (40% vs 43.33%), followed by moderate knowledge (33.33% vs 13.33%). Educational intervention had a positive impact on the knowledge scores of the stone patients (experimental: Initial-53.81%, Final-95.48%, Control: Initial-55%, Final-56.98%). Improvement in dietary and life style pattern was observed after the intervention (53.33%), viz., increased water and fluid consumption, restricting salt, tea, bakery products, sugar, animal foods, fats, purine and oxalate rich foods. Thus, it was concluded that nutrition education is useful in the management of urolithiasis.

**Key words:** Body mass index, Nutrition, Urolithiasis, Waist

### Introduction

The incidence of kidney stones is rising in rural and urban societies in India. It has gained increasing significance due to changes in life style and living conditions, industrialization and urbanization. In India, approximately 5-7 million patients suffer from stone disease and at least 1 out of 1000 in Indian population needs hospitalization due to kidney stone disease (Vyas *et al.*, 2012). An unhealthy lifestyle may lead to higher incidence of kidney stones. For example, drinking too little water or the wrong types of fluids, such as soft drinks or drinks with caffeine, may cause substances in the urine to become too concentrated. Too much sodium, or salt, in the diet may contribute to more chemicals in the urine, causing an increase in stone formation (Anon., 2011). Kidney stones are not only painful, but the diagnosis and treatment are expensive. The patients may incur expenses from testing, medications, visits to the doctor and possibly surgery for stone removal. Development of suitable nutrition education material will help in prevention and management of stone disease by suitable diet and life style modification. Therefore, the present study was planned to develop suitable nutrition education material and to know its impact on knowledge and practices of the kidney stone patients.

### Material and methods

A total of sixty kidney stone patients who were willing to participate in the study were selected from local hospitals of Hubli-Dharwad. Thirty subjects were taken as experimental and equal number of age and gender matched controls were taken. A pretested questionnaire was developed to collect general

information, health status, past history of stones and life style factors. The anthropometric measurements viz., height, weight, waist and hip circumference were measured and recorded as per the guidelines suggested by Srilakshmi (2006). To assess the knowledge of subjects regarding kidney stones questionnaire was developed which included questions on meaning of kidney stones, symptoms, risk factors associated, types, diagnostic criteria and management through diet and life style. The questionnaire had 42 multiple choice questions. For the selected subjects educational intervention was given in 3 phases, at 15 days interval, details of the educational materials developed and the sessions held are given in Fig. 1. Knowledge level was assessed before and after intervention. The impact of nutrition education was assessed in terms of gain in knowledge. Food habits and life style of the subjects were elicited before and after the educational intervention by interviewing them. Frequency and percentages were used to interpret the data. Chi square test was used to find the significance of association between knowledge level with age, gender, education and income.

### Results and discussion

Demographic profile of 60 subjects selected for intervention study is presented in Table 1. Male subjects were more in number compared to females in both the groups (53.33% and 46.67%). More than one fourth subjects belonged to the age group of 41-50 years followed by 31-40 years in both the groups (26.67% and 23.33%, respectively). Maximum number of the subjects studied upto intermediate level (33.33% and 40% in both the

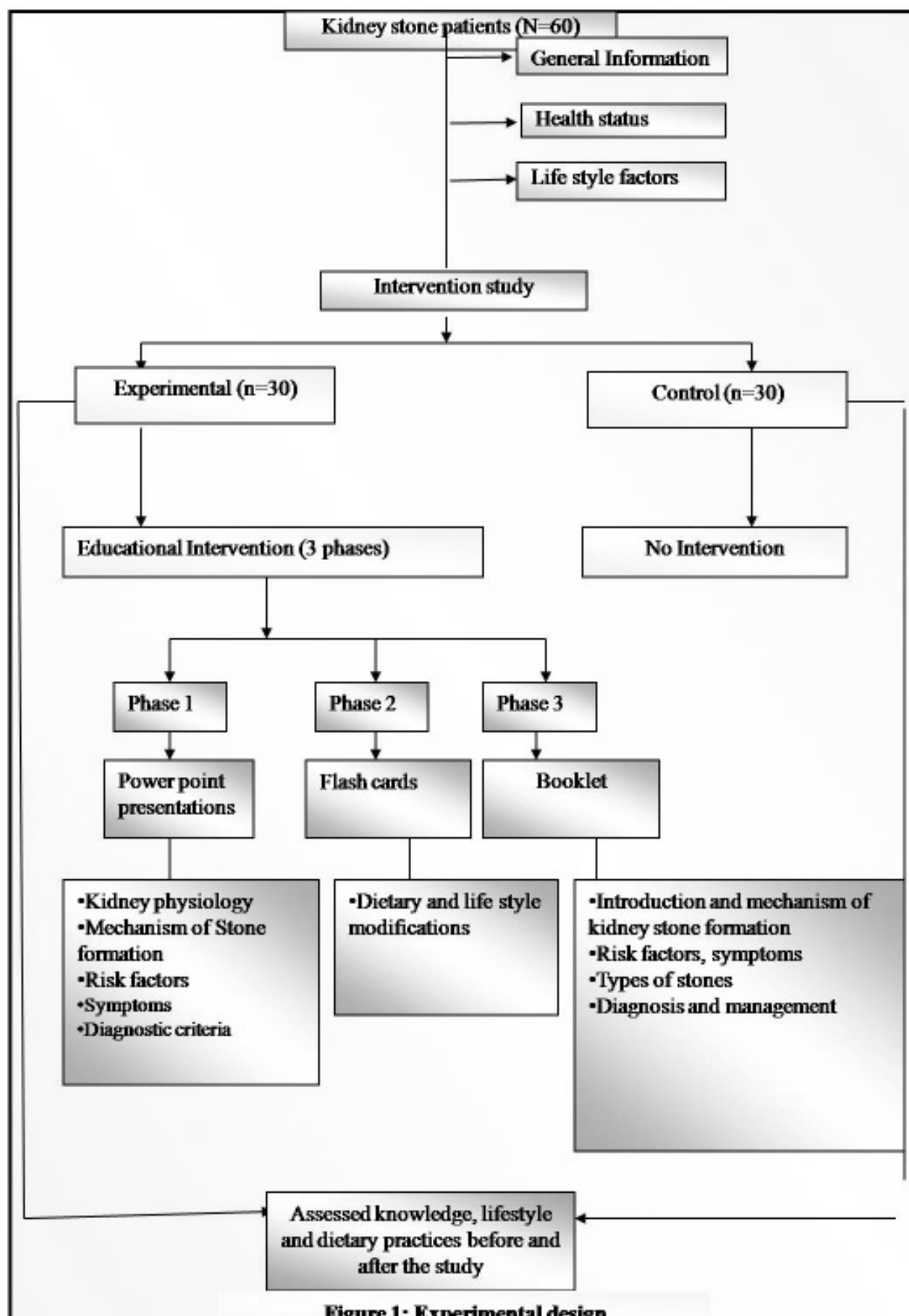


Table 1. Demographic profile of subjects selected for intervention study

N=60

Demographic profile	Experimental group (n=30)		Control group (n=30)		Total (n=60)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Age (yrs)						
<20	5	16.67	5	16.67	10	16.67
21-30	5	16.67	5	16.67	10	16.67
31-40	7	23.33	7	23.33	14	23.33
41-50	8	26.67	8	26.67	16	26.67
51-60	4	13.33	4	13.33	8	13.33
>60	1	3.33	1	3.33	2	3.33
Gender						
Male	16	53.33	16	53.33	32	53.33
Female	14	46.67	14	46.67	28	46.67
Education level						
Illiterates	-	-	1	3.33	1	1.67
Primary school	7	23.33	3	10.00	10	16.67
High school	8	26.67	4	13.33	12	20.00
Intermediate	10	33.33	12	40.00	22	36.67
Graduate	5	16.67	8	26.67	13	21.67
Post graduate	-	-	2	6.67	2	3.33
Religion						
Hindu	22	73.33	27	90.00	49	81.67
Muslim	8	26.67	3	10.00	11	18.33
Working environment						
Working under direct sun light	12	40.00	2	6.67	14	23.33
Working in shade	14	46.67	26	86.67	40	66.67
Working with hot machine	4	13.33	2	6.67	6	10.00
Monthly income(Rs.)						
<5000	15	50.00	19	63.33	34	56.67
5001-10,000	13	43.33	9	30.00	22	36.67
10,001- 15,000	2	6.67	1	3.33	3	5.00
e"15,001	-	-	1	3.33	1	1.67
Family size						
Small (<4)	2	6.67	3	10.00	5	8.33
Medium (4-6)	18	60.00	20	66.67	38	63.33
Large (7-9)	6	20.00	5	16.67	11	18.33
Very large (>9)	4	13.33	2	6.67	6	10.00
Type of family						
Nuclear	18	60.00	20	66.67	38	63.33
Joint	12	40.00	10	33.33	22	36.67
Activity pattern						
Sedentary	21	70.00	24	80.00	45	75.00
Moderate	9	30.00	6	20.00	15	25.00
Area of living						
Urban	22	73.33	20	66.67	42	70.00
Rural	8	26.67	10	33.33	18	30.00
Type of diet						
Vegetarian	12	40.00	14	46.67	26	43.33
Non vegetarian	18	60.00	16	53.33	34	56.67

groups). Majority of them were Hindus (73.33% and 90%), worked in shade (46.67% and 86.67%), were leading sedentary life style (70% and 80%), had income less than five thousand per month (50% and 63.33%), medium sized family (60% and 66.67%), lived in urban area (73.33% and 66.67%), had non-vegetarian food habit (60% and 53.33%).

Family history of kidney stone disease among subjects is shown in Fig. 2. Totally 37 per cent subjects had family history of stone disease out of which 23 per cent had maternal

influence, 12 per cent had paternal influence, 2 per cent had both parents influence for causation of stone disease. Individuals with a family history of stone disease have nearly threefold higher risk of developing kidney stones than those without a family history. Vezzoli *et al.* (2011) suggested that, calcium-sensing receptor (CaSR) is one of the candidate genes explaining individual predisposition to calcium nephrolithiasis. Stone formation may be favored by an altered CaSR expression in kidney medulla involving the normal balance among calcium,

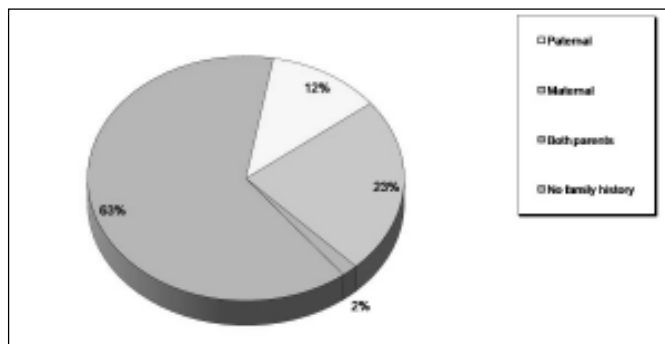


Fig. 2. Family history of kidney stone disease among intervention subjects

phosphate, protons and water excretion. About 63 per cent had no genetic influence for causation of disease. The environmental causes for stone disease in the present study may be attributed

to obesity, higher consumption of purine rich non vegetarian foods, less fluid consumption, higher intake of oxalate rich foods, fatty foods and sodium rich foods.

Anthropometric measurements of kidney stone patients are denoted in Table 2. When both the groups were considered more number of experimental subjects belonged to overweight category (experimental 46.67%, control 30%). About one fourth of experiment subjects (26.67%) belonged to obese grade I category. Whereas, very few control subjects were present in this category (6.67%). On the other hand, very few subjects in control group belonged to obesity grade II (6.67 %), and none of them in experimental group were present in this category. When waist to hip ratio was considered totally 55 per cent subjects belonged to normal category and 45 per cent subjects were abdominally obese. There is a direct relation between urinary oxalate excretion and body size; it may be due to

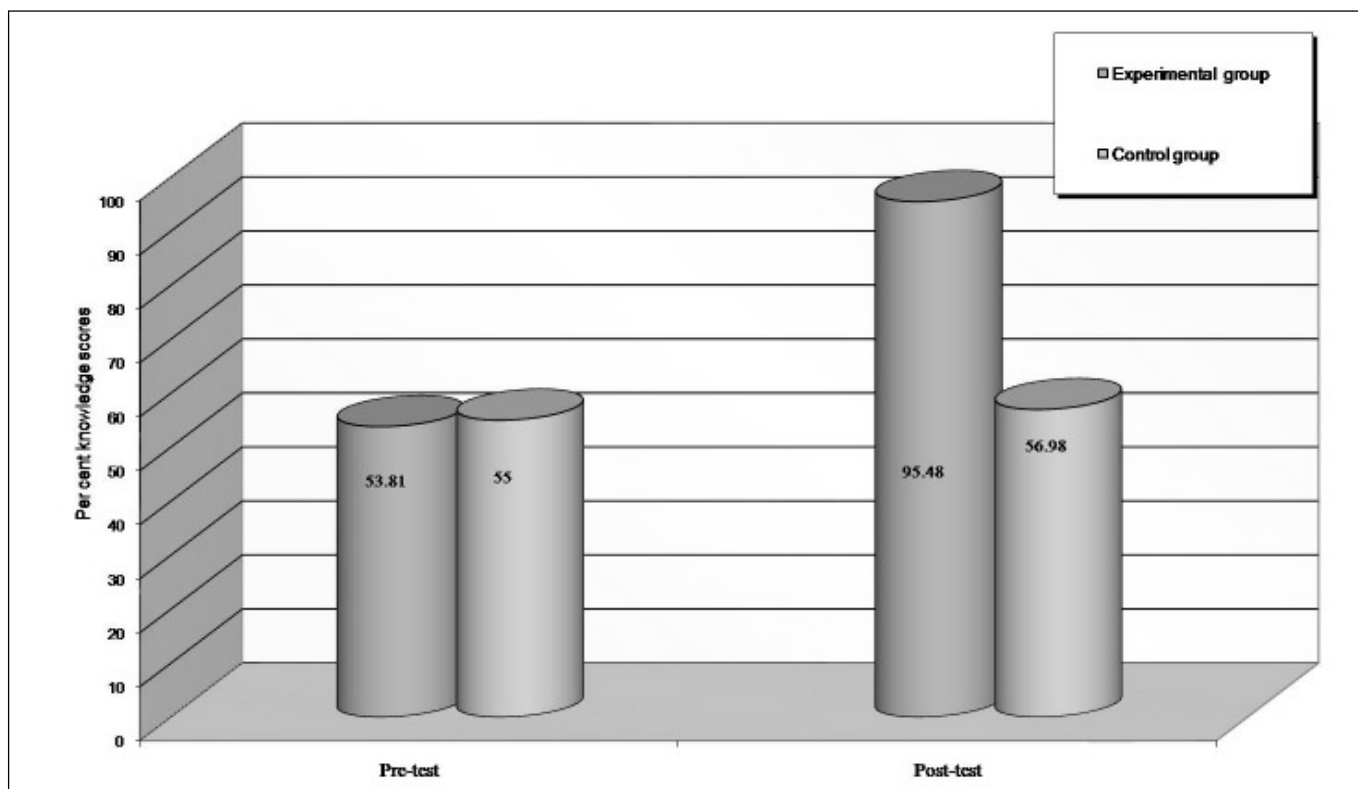


Fig. 3 Impact of nutrition education on knowledge scores of the kidney stone patients

Table 2. Classification of patients based on Body Mass Index (BMI) and Waist to Hip Ratio (WHR)

BMI classifications	Presumptive diagnosis	Groups				Total	
		Experimental (n=30)		Control (n=30)		Total	
		Frequency	%	Frequency	%	Frequency	%
<18.5	Under weight	1	3.33	7	23.33	8	13.33
18.5-22.9	Ideal BMI	7	23.33	10	33.33	17	28.33
>23.0-24.9	Over weight	14	46.67	9	30.00	23	38.33
>25.0-29.9	Obese Grade – I	8	26.67	2	6.67	10	16.67
>30	Obese Grade - II	-	-	2	6.67	2	3.33
WHR classification							
Male <0.95							
Female <0.80	Non obese	17	56.67	16	53.33	33	55.00
Male e"0.95	Abdominally obese	13	43.33	14	46.67	27	45.00
Female e"0.80							

BMI: Body Mass Index WHR: Waist to Hip Ratio

Table 3. Classification of kidney stone patients based on knowledge\*

N=60

Knowledge level	Groups				Total	
	Experimental (n=30)		Control(n=30)			
	Frequency	%	Frequency	%	Frequency	%
Low (<50 %)	12	40.00	13	43.33	25	41.67
Moderate (51-57 %)	10	33.33	4	13.33	14	23.33
High (>58 %)	8	26.67	13	43.33	21	35.00

\*Based on the formulae: Mean $\pm$ SD(0.425)

Table 4. Association of knowledge level (before intervention) with age, gender, education and income of kidney stone patients

N=60

Characteristics	Knowledge level			Row total	$\chi^2$
	Low	Moderate	High		
Age (years)					
<20	8 (80.00)	2(20.00)	-	10	13.516 <sup>NS</sup>
21-30	4(40.00)	1(10.00)	5(50.00)	10	
31-40	4(28.60)	3(21.40)	7(50.00)	14	
41-50	7(43.80)	5(31.20)	4(25.00)	16	
51-60	2(25.00)	2(25.00)	4(50.00)	8	
>60	-	1(50.00)	1(50.00)	2	
Gender					
Male	17(53.10)	5(15.60)	10(31.20)	32	4.182 <sup>NS</sup>
Female	8(28.60)	9(32.10)	11(39.30)	28	
Education level					
Illiterate	1(100.00)	-	-	1	26.053**
Primary School	3(30.00)	5(50.00)	2(20.00)	10	
High School	8(66.70)	-	4(33.30)	12	
Intermediate	12(54.50)	4(18.20)	6(27.30)	22	
Graduate	1(7.70)	3(23.10)	9(69.20)	13	
Post-graduate	-	2(100.00)	-	2	
Income					
<5000	19(55.90)	5(14.70)	10(29.40)	34	12.956 <sup>NS</sup>
5001-10000	4(18.20)	7(31.80)	11(50.00)	22	
10001-15000	2(66.70)	1(33.30)	-	3	
$\geq$ 15001	-	1(100.00)	-	1	

NS: Non Significant

endogenous production with larger body size. Overweight and obesity are strongly associated with an elevated risk of stone formation in both genders due to an increased urinary excretion of promoters but not inhibitors of calcium oxalate stone formation Siener *et al.* (2004). Insulin resistance is associated with obesity which can also alter the composition of the urine. Insulin resistance may manifest in the kidneys as a defect in ammonia production and the ability to excrete acid and lower urinary pH, this is generally associated with uric acid stones (Taylor *et al.*, 2005). Overweight and obesity could be associated with kidney stones through a defect in glucose metabolism (Soldati *et al.*, 2014).

Classification of kidney stone patients based on the knowledge showed that (Table 3), more than 40 per cent subjects in experimental and control group had low knowledge, followed by moderate knowledge (33.33% and 13.33%) category. Therefore, there is a need to impart nutrition knowledge and awareness to the kidney stone patients regarding the disorder.

The knowledge level of stone patients was positively and significantly associated with their education level ( $p < 0.01$ , Table 4). This association of knowledge with education level in this study may be due to accessibility of patients to the information through magazines, news papers and internet on kidney disease.

Table 5. Impact of educational intervention on dietary and lifestyle pattern of stone patients

N=30

Modifications	Frequency	Percentage
Not modified dietary and lifestyle pattern	14	46.67
Modified dietary and lifestyle pattern*	16	53.33
Increased water consumption	13	43.33
Increased number of voiding	13	43.33
Restricting tea	13	43.33
Restricting bakery foods	12	40.00
Doing regular exercise	11	36.67
Restricting salt	10	33.33
Consuming less beetle leaves and beetel nut	10	33.33
Restricting sugar	9	30.00
Restricting animal foods	9	30.00
Restricting purine rich foods	9	30.00
Restricting oxalate rich foods	8	26.67
Restricting fatty foods	7	23.33
Consuming more of fruit juices	6	20.00
Working in shade	5	16.67

\*multiple responses given by subjects

Impact of nutrition education on knowledge scores of the kidney stone patients is denoted in Fig. 3. Initial knowledge scores in both experimental group and control group was similar ( $53.81 \pm 8.44\%$  vs  $55 \pm 10.74\%$ ) and the means were statistically

non significant. Post knowledge score was significantly higher in experimental group compared to control group ( $95.48 \pm 3.26\%$  vs  $56.98 \pm 10.42\%$ ). Nutrition education brought positive improvement in the knowledge scores of the stone subjects. Similarly Babitadevi (2005) found that planned teaching programmes by using pamphlets, charts and flash cards helps to increase the knowledge of kidney stone patients. Awasthi (2010) noted better understanding and improvement in the knowledge of selected kidney stone patients in the education cum counseling programme. Positive improvement found in present study in the knowledge of kidney stone patients may be attributed to the phase wise education in the form of power point slides, flash cards and booklet.

Impact of educational intervention on dietary and lifestyle pattern of stone patients is presented in Table 5. About half the subjects modified their dietary and lifestyle pattern after the education intervention (53.33%). About 43.33 per cent subjects increased water consumption, restricted tea consumption and increased fruit juice consumption (20%), improved the life style

practices viz., increased number of voiding (43.33%), regularly exercised (36.67%), started working in shade (16.67%). The foods restricted by subjects after the intervention were bakery foods (40%), salt, betel leaves and betel nut (33.33% each), sugar (30%), animal and purine rich foods (30% each), oxalate rich foods (26.67%) and fatty foods (23.33%). The changes in practice noted in the present study may be the positive impact of nutrition intervention.

## Conclusion

The knowledge level of urolithiasis patients was positively and significantly associated with their education level. Educational intervention through effective teaching aids resulted in improvement of knowledge scores. Half of the subjects showed positive improvement in their dietary and life style pattern after the intervention viz., increased water and fluid consumption, restricting salt, tea, bakery products, sugar, animal foods, fats, purine and oxalate rich foods. Education intervention through teaching aids was found to be useful in improving knowledge of kidney stone patients

## References

- Anonymous, 2011, National Institute of Diabetes and Kidney Disease. *NIH Publ.*, 11-7383:1-8.
- Awasthi, M., 2010, Counselling of kidney stone patients based on their dietary pattern in the selected areas of district Kangra (H.P.). *Ph.D. Thesis*, Himachal Pradesh Krishi Vishva Vidyalaya, Palampur (India).
- Babitadevi, C., 2005, A study to evaluate the effectiveness of planned teaching programme on renal calculi and its management among the renal calculi patients in selected hospitals in Mangalore Taluk. *M.Sc. Nursing Thesis*, Rajiv Gandhi Health Sci., Bangalore (Karnataka).
- Siener, R., Glatz, S., Nicolay, C. and Hesse, A., 2004, The role of overweight and obesity in calcium oxalate stone formation. *Obesity Res.*, 12: 106-113.
- Soldati, L., Bertoli, S., Terranegra, A., Brasacchio, C., Mingione, A., Dogliotti, E., Raspini, B., Leone, A., Frau, F., Vignati, L., Spadafranca, A., Vezzoli, G., Cusi, D. and Battezzati, A., 2014, Relevance of Mediterranean diet and glucose metabolism for nephrolithiasis in obese subjects. *J. Translational Med.*, 12: 1-6.
- Srilakshmi, B., 2006, Nutrition Science. New Age International Publishers, New Delhi, India.
- Taylor, E.N., Stamfer, M. J., Curhan, G. C., 2005, Obesity, weight gain, and the risk of kidney stones. *JAMA*, 293: 455-462.
- Vezzoli, G., Terranegra, A., Rainone, F., Arcidiacono, T., Cozzolino, M., Aloia, A., Dogliotti, E., Cusi, D. and Soldati, L., 2011, Calcium-sensing receptor and calcium kidney stones. *J. Translational Med.*, 9 (201): 1-9.
- Vyas, A.S., Patel, M. B., Patel, A.I. and Joshi, N.R., 2012, Epidemiology of renal stone ailment in few district of Gujarat state. *An Int. J. Pharmaceutical Sci.*, 3(2): 232-239.