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Effectiveness Of Nursing Education Program On Knowledge Regarding Prevention Of Renal Calculi Among Young Adults

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Abstract:
Introduction *Kidney stones are hard crystal deposits in the urinary tract, commonly caused by dehydration, poor diet, and medical conditions. Symptoms include severe pain, blood in the urine, and nausea. Men aged 30–60 are most affected. In India, about 12% of the population is affected, with a higher risk in hot regions. In Asia, prevalence ranges from 1%–19.1%. Calcium oxalate stones are most common. Recurrence is frequent, with rates up to 53% in 3–5 years. Prevention includes hydration and dietary changes. Treatment depends on the stone type and size. Nursing education in high-risk areas like Vadodara can help reduce incidence and improve awareness.*
Aim: *The aim of the study was to assess the effectiveness of a nursing education program in improving knowledge regarding the prevention of renal calculi among young adults residing in selected areas of Vadodara, Gujarat.*
Methodology: *A quantitative research approach was used with a pre-experimental one-group pretest-posttest design. A total of 100 young adults aged 18–25 years were selected using a non-probability convenience sampling technique. Data collection tools included a socio-demographic questionnaire and a self-structured knowledge questionnaire on renal calculi prevention. Data were analyzed using descriptive and inferential statistics.*
Result: *The mean pre-test knowledge score was 12.87 (SD = 4.546), which increased significantly to 20.94 (SD = 4.902) in the post-test. The paired t-test value was 12.287, with a p-value of 0.0001, indicating a statistically significant improvement in knowledge. Chi-square analysis showed a significant association between monthly income and pre-test knowledge, while other demographic variables showed no significant relationship.*
Conclusion: *The study concluded that the nursing education program was effective in improving knowledge regarding the prevention of renal calculi among young adults. Structured health education can be a powerful tool in promoting preventive health behaviors.*
Keywords: *Nursing Education Program, Knowledge, Prevention, Renal calculi, Young Adults.*

INTRODUCTION

Renal calculi, commonly referred to as kidney stones, are solid crystal formations that develop within the urinary tract.[1] These stones can vary in size and composition, with some being as small as a grain of sand, while others can grow to be as large as a golf ball.[2] The kidneys play a crucial role in maintaining the body's internal environment by filtering waste products from the blood and regulating the balance of fluids and electrolytes.[3]

Several factors can increase the risk of developing kidney stones. Dehydration, which can lead to a more concentrated urine, is a significant risk factor. A diet high in animal protein, salt, and oxalate-rich foods can also contribute to stone formation.[4] Other risk factors include obesity, certain medical conditions such as hyperparathyroidism or gout, and a family history of kidney stones.[4] Common symptoms of kidney stones include severe pain in the back, side, or lower abdomen, blood in the urine, and nausea or vomiting.[5] In some cases, a kidney stone may become lodged in the urinary tract, causing a blockage that can lead to infection or kidney damage.[6]

Kidney stones are more common in men, especially between the ages of 30 to 60 years. In India, about 12% of the population is affected.[7] The risk is higher in hot climate regions due to increased fluid loss and dehydration. Dehydration reduces urine output, leading to the formation of concentrated urine, which promotes stone formation. Factors like diet, genetics, and lifestyle also contribute to the risk.[8]

Urolithiasis affects 1%–19.1% of the population in Asia, with higher prevalence seen in West Asia, South Korea, and Japan (5%–19.1%), and lower rates in East and North Asia (1%–8%). In India, 5–7 million people suffer from kidney stones, with 7–10 per 1000 requiring hospitalization. Globally, 10%–12% of people in industrialized nations are affected, and lifetime risk ranges from 5%–10%.[9] Kidney stones are more common in men, with 13% of men and 7% of women developing them. Calcium

oxalate stones are the most common (75%–90%), followed by uric acid, calcium phosphate, struvite, and cystine stones. Recurrence rates range from 21%–53% within 3–5 years, with highest incidence after age 30.[10]

The global rise in kidney stones is linked to factors such as poor hydration, hot climates, sedentary lifestyles, high salt and protein diets, and genetic predisposition.[11] Preventive strategies include increased water intake, dietary modifications, and regular monitoring. Medical, minimally invasive, and surgical treatments are available based on stone size and type.[12]

The growing burden of kidney stones underscores the importance of public awareness and preventive care.[13] Nursing-led educational interventions, especially in high-risk areas like Vadodara, can significantly enhance knowledge about kidney stone prevention, promote healthy practices among youth, and reduce disease recurrence and hospitalization rates.[14]

METHODOLOGY

The study employed a quantitative evaluative approach using a pre-experimental one-group pre-test-post-test design to assess the effectiveness of a nursing education program on the prevention of renal calculi. The research was conducted in selected areas of Vadodara, Gujarat, where young adults could easily access the intervention. A total of 100 young adults aged 18–25 years were selected using a non-probability convenience sampling technique. Inclusion criteria comprised young adults residing in the selected areas who were willing to participate in the education program, while those with a history of renal calculi, currently undergoing treatment, with cognitive impairments, language barriers, or unwillingness to participate were excluded.

The independent variable in this study was the nursing education program on renal calculi prevention, and the dependent variable was the participants' knowledge regarding prevention of renal calculi. Data collection tools included two sections: Section I gathered socio-demographic data such as age, gender, area of residence, monthly income, parents' education and occupation, family type, previous knowledge of renal calculi prevention, and sources of information; Section II consisted of a self-structured knowledge questionnaire focused on dietary habits, fluid intake, lifestyle factors, and other preventive measures related to renal calculi.

A pilot study was conducted on 10% of the total sample (10 young adults) in selected areas of Vadodara to assess the feasibility and practicability of the study. Permission was obtained from relevant authorities, and participants received the nursing education program, followed by assessment of knowledge before and after the intervention. Data from the pilot were analyzed using descriptive and inferential statistics, and upon confirmation of feasibility, the main study was implemented.

For data analysis, both descriptive and inferential statistics were employed. Frequency and percentage distributions described the demographic variables, while mean and standard deviation measured knowledge levels on prevention of renal calculi. Inferential statistics included the paired 't'-test to compare pretest and posttest knowledge scores, and the chi-square test to identify associations between pretest knowledge and selected demographic variables.

RESULT

Table 1: Frequency and Percentage Distribution of Demographic Variables of the Participants n=100

S. No.	Demographic Variable	Category	Frequency (F)	Percentage (%)
1	Age	18–20 years	31	31.00%
		21–23 years	40	40.00%
		24–25 years	29	29.00%
2	Gender	Male	56	56.00%

		Female	44	44.00%
3	**Residential Area**	**Urban**	58	58.00%
		Rural	42	42.00%
4	**Monthly Income (INR)**	**Less than 5000**	13	13.00%
		5000–10000	29	29.00%
		10000–20000	26	26.00%
		More than 20000	32	32.00%
5	**Parents' Education**	**Primary School**	17	17.00%
		Secondary School	21	21.00%
		Higher Secondary	19	19.00%
		Graduate	22	22.00%
		Postgraduate	21	21.00%
6	**Parents' Occupation**	**Government Job**	19	19.00%
		Private Job	26	26.00%
		Business	15	15.00%
		Agriculture	19	19.00%
		Others	21	21.00%
7	**Family Type**	**Nuclear**	50	50.00%
		Joint	50	50.00%
8	**Previous Knowledge about Renal Calculi**	**Yes**	80	80.00%
		No	20	20.00%
9	**Sources of Information**	**None**	20	20.00%
		Internet	13	13.00%
		Healthcare Provider	36	36.00%
		Family Members	19	19.00%

		Friends	12	12.00%

Table 1 present the demographic characteristics of the 100 young adult participants in the study. The largest age group was 21–23 years (40%), followed by 18–20 years (31%) and 24–25 years (29%). In terms of gender, 56% were male and 44% were female. A majority of participants (58%) lived in urban areas, while 42% were from rural settings. Monthly family income distribution showed that 32% of participants reported earnings above ₹20,000, 29% earned between ₹5,000–₹10,000, 26% between ₹10,000–₹20,000, and 13% had incomes below ₹5,000. Parental education levels varied, with 22% being graduates, 21% postgraduates, 21% with secondary education, 19% higher secondary, and 17% primary-level education. In terms of occupation, 26% of parents were employed in private jobs, 19% in government jobs, 19% in agriculture, 15% in business, and 21% engaged in other forms of employment. Family type was evenly distributed, with 50% of participants from nuclear families and 50% from joint families. Prior knowledge about renal calculi prevention was reported by 80% of participants, while 20% had no such knowledge. The main sources of information included healthcare providers (36%), family members (19%), the internet (13%), and friends (12%), while 20% had no source of information. These demographic insights provide a well-rounded understanding of the participants' backgrounds and help in analyzing the impact of the nursing education program on renal calculi prevention.

Figure 1: Percentage Distribution of knowledge regarding the Prevention of Renal Calculi Among Young Adults

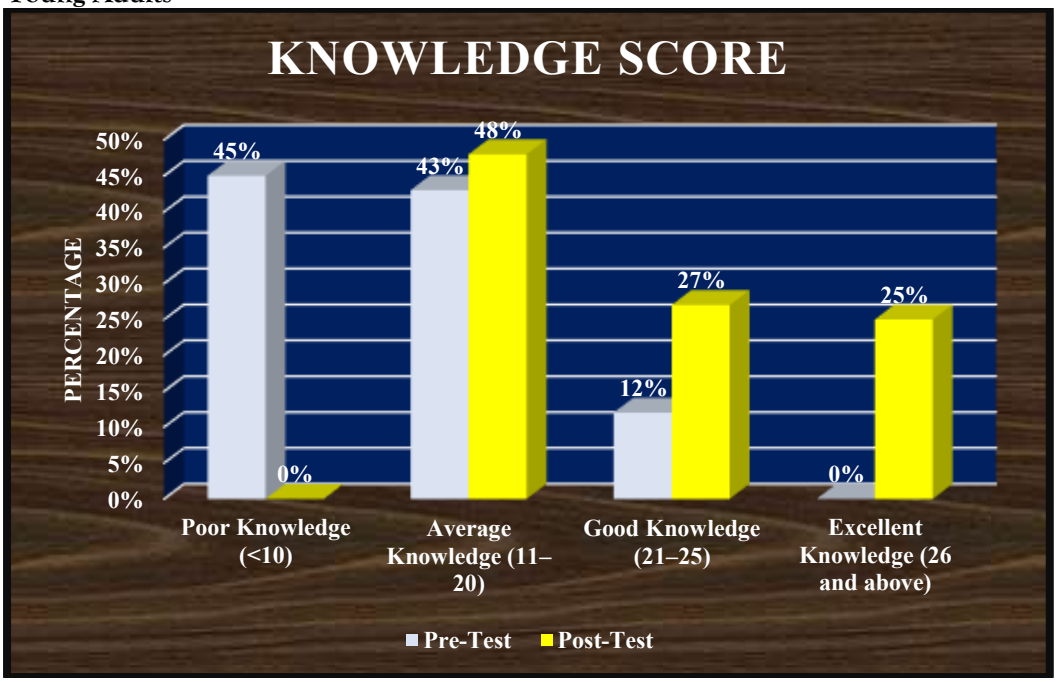

Figure 1 depicts the participants' knowledge levels on renal calculi prevention before and after the nursing education program. In the pre-test, 45% had poor knowledge, 43% had average knowledge, and only 12% had good knowledge, with no participants scoring in the excellent category. Following the intervention, there was a significant improvement—none remained in the poor category, 48% had average knowledge, 27% had good knowledge, and 25% achieved excellent scores. This clear shift demonstrates the effectiveness of the nursing education program in improving knowledge among young adults.

Figure 2: Descriptive statistics of knowledge regarding the Prevention of Renal Calculi Among Young Adults

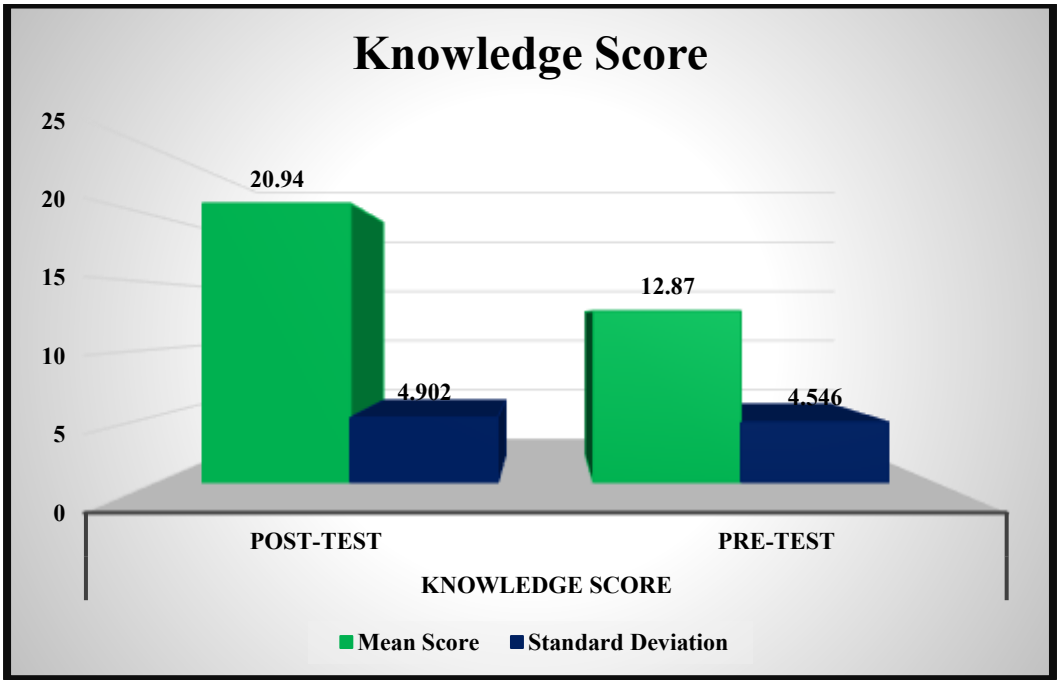

Figure 2: highlights the descriptive statistics of knowledge scores before and after the nursing education program. The mean pre-test score was 12.87 (SD = 4.546), indicating moderate knowledge with some variability. Post-test results showed a significant increase in the mean score to 20.94 (SD = 4.902), reflecting improved understanding of renal calculi prevention. The slight rise in standard deviation suggests varied levels of learning among participants. Overall, the data confirms the effectiveness of the nursing education program in enhancing knowledge among young adults.

Table 2: Paired t-test Analysis Showing the Effectiveness of Nursing Education Program on Knowledge Regarding Prevention of Renal Calculi Among Young Adults
n=100

Knowledge Score	Mean Score	Standard Deviation	Degree of Freedom	Calculated 't' Value	Tabulated 't' Value	Level of Significance
Post-test	20.94	4.902	99	12.287	1.984	0.0001*
Pre-test	12.87	4.546				

Table 2 presents the paired t-test results evaluating the effectiveness of the nursing education program on young adults' knowledge regarding renal calculi prevention. The mean knowledge score significantly increased from 12.87 (SD = 4.546) in the pre-test to 20.94 (SD = 4.902) in the post-test. The calculated 't' value of 12.287 (df = 99) exceeded the tabulated value of 1.984 at the 0.05 significance level, with a p-value of 0.0001, indicating a statistically significant difference. These findings support Hypothesis H1 and confirm the effectiveness of the educational intervention.

Table 3: Chi- square Association Between Pre-Test Knowledge Scores Regarding Prevention of Renal Calculi Among Young Adults with the selected demographic variables
n=100

S. No.	Demographic Variable	Category	F	Knowledge Score			df	χ^2 Value	p-value
				Poor	Average	Good			

1	**Age**	**18–20 years**	31	17	9	5	4	6.189	0.185
		21–23 years	40	13	22	5			
		24–25 years	29	15	12	2			
2	**Gender**	**Male**	56	26	23	7	2	0.194	0.907
		Female	44	19	20	5			
3	**Residential Area**	**Urban**	58	25	27	6	2	0.831	0.66
		Rural	42	20	16	6			
4	**Monthly Income (INR)**	**Less than 5000**	13	7	6	0	6	13.131	0.041*
		5000–10000	29	14	12	3			
		10000–20000	26	16	9	1			
		More than 20000	32	8	16	8			
5	**Parents' Education**	**Primary School**	17	10	6	1	8	4.644	0.795
		Secondary School	21	7	11	3			
		Higher Secondary	19	10	7	2			
		Graduate	22	11	8	3			
		Postgraduate	21	7	11	3			

6	**Parents' Occupation**	**Government Job**	19	7	11	1	8	11.415	0.179
		Private Job	26	8	14	4			
		Business	15	9	6	0			
		Agriculture	19	8	7	4			
		Others	21	13	5	3			
7	**Family Type**	**Nuclear**	50	24	18	8	2	2.673	0.263
		Joint	50	21	25	4			
8	**Previous Knowledge about Renal Calculi**	**Yes**	80	34	36	10	2	1.011	0.603
		No	20	11	7	2			
9	**Sources of Information**	**None**	20	11	7	2	8	5.28	0.727
		Internet	13	8	3	2			
		Healthcare Provider	36	12	19	5			
		Family Members	19	8	9	2			
		Friends	12	6	5	1			

Table 3 presents the Chi-square test results examining the association between pre-test knowledge scores on renal calculi prevention and selected demographic variables among young adults. The analysis, conducted at a 0.05 significance level, revealed that only monthly income had a statistically significant association with pre-test knowledge ($\chi^2 = 13.131$, df = 6, $p = 0.041$). Other variables such as age, gender, residential area, parents' education and occupation, family type, prior knowledge, and sources of information showed no significant association. These findings partially support Hypothesis H2, highlighting that income level influenced knowledge, while other demographic factors did not.

DISCUSSION

The present study clearly demonstrates that aparticipants' knowledge levels on renal calculi prevention before and after the nursing education program. In the pre-test, 45% had poor knowledge, 43% had average knowledge, and only 12% had good knowledge, with no participants scoring in the excellent category. Following the intervention, there was a significant improvement—none remained in the poor category, 48% had average knowledge, 27% had good knowledge, and 25% achieved excellent scores. This clear shift demonstrates the effectiveness of the nursing education program in improving knowledge among young adults.

A similar study, **Tharani and Thomas (2018)**, conducted a quasi-experimental study on the effectiveness of an educational intervention on knowledge regarding urinary calculi among college students. In their study, pre-test results showed that 40% of students had poor knowledge and only 10% had good knowledge. After the intervention, 65% of participants demonstrated good knowledge, and no one remained in the poor category. The authors concluded that health education significantly improved awareness, especially in dietary habits, fluid intake, and lifestyle modifications.[15]

Chi-square test results examining the association between pre-test knowledge scores on renal calculi prevention and selected demographic variables among young adults. The analysis, conducted at a 0.05 significance level, revealed that only monthly income had a statistically significant association with pre-test knowledge ($\chi^2 = 13.131$, df = 6, p = 0.041).

A similar study was conducted by **Alizadeh et al. (2022),** which examined socioeconomic inequalities in kidney stone prevalence among 20,427 adults in Iran. The study found that individuals in the highest wealth quintile had significantly higher odds of having kidney stones (OR = 1.51, 95% CI: 1.34–1.69) compared to those in the lowest quintile, indicating a strong link between income and disease awareness or diagnosis. Although their focus was on prevalence rather than knowledge, the socioeconomic disparity mirrors our finding that monthly income was significantly associated with pre-test knowledge scores on renal calculi prevention ($\chi^2 = 13.131$, $p = 0.041$). Other demographic variables such as age, gender, and educational background showed no significant association in both studies, reinforcing the conclusion that income level plays a pivotal role in influencing health knowledge and outcomes related to renal calculi.[16]

CONCLUSION

The study found that the nursing education program was effective in improving the knowledge of young adults about how to prevent kidney stones (renal calculi). Before the program, many participants had low or average knowledge, but after the program, most showed a clear improvement. The increase in knowledge was statistically significant, meaning the changes were not just by chance. Among the different background factors, only family income was linked to how much participants knew before the program. Overall, the study shows that educating young adults can make a real difference in preventing kidney stones.

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Conflict of Interest: The authors hereby declare that there are no conflicts of interest associated with this research study.

Ethical Consideration: Ethical approval for the study was granted by the Parul Institute Ethics Committee (PIEC), Vadodara, Gujarat. Participants were fully informed about the study objectives, and informed consent was obtained from all before data collection commenced.

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