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EFFECTIVENESS OF A STRUCTURED TEACHING PROGRAM ON KNOWLEDGE AND PRACTICE REGARDING PREVENTION OF TYPE 2 DIABETES MELLITUS AMONG ADOLESCENTS IN SELECTED SCHOOLS OF KERALA

Nursing

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ABSTRACT

T2DM has become global epidemic affecting 69.2 million Indians. Kerala has 1.24 million people (21.9%) with diabetes and 36.7% with prediabetes. Present study assessed and compared the knowledge and lifestyle of adolescents regarding prevention of T2DM before and after a structured teaching programme (STP) in central Kerala.

Methods Experimental design with pretest posttest control experimental groups was adopted. Multistage stratified random sampling was done to select 975 adolescents from 2 districts in to control and experimental groups. Institutional ethical clearance was taken. Validated, reliability tested lifestyle inventory and knowledge questionnaire was developed. Pretest given to both groups. Experimental group was given STP. Post-test given 30 days after pretest to both groups.

Results: Knowledge on risk factors was high and low on complications. Reported physical activity was <30 min/ day in 72% and 56.2% adolescents from control and experimental groups respectively. Control group subjects spend >4 hours to <10 hours and from experimental group (35.6% and 31.9%) spend 10 - 24 hours /day on sedentary pursuits. Significant ($p<0.002$) gain in knowledge among experimental group compared to control group. Significant difference ($p<0.001$) in lifestyle of experimental group reported for food habits, healthy and sedentary activities during holidays after intervention. Age, gender & paternal T2DM showed association with the knowledge while income, religion and maternal occupation with lifestyle.

Conclusion: Lifestyle changes after STP support Health Belief Model. Study finding appeals early childhood intervention.

KEYWORDS

Type 2 Diabetes Mellitus, prevention, adolescents, knowledge, lifestyle.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a global epidemic which has looming implications for youth. Globally around 451 million people suffer from diabetes which is expected to reach 642 million by 2040. Every 11th person in the world is a diabetic, and every 6 seconds, a person dies of DM.

Background

India has 69.2 million people with diabetes and 36.5 million with Impaired Glucose Tolerance (IGT) and accounts for 1 million diabetes related deaths every year. Kashmir has the least prevalence of 6.1% while Kerala has a high prevalence of 27.11%. Kerala has 20% (1.24 million) people diagnosed with overt DM and another 22.67% with pre diabetes. The Indian Council of Medical Research (ICMR) INDIAB study (2011) reported prevalence of DM from 10.9 to 14.2% in urban areas, and 3.0 to 8.3% in rural areas. More males (21.9%) are affected than females (20.1%). In Kerala, Ernakulum topped with 19.5% while Idukki had 5.4% diabetic population.

Significance of the problem

Diabetes goes undetected at early stages but 20% cases present with complications at the time of diagnosis. Diabetes being the leading cause of blindness, kidney failure, amputations and heart attacks, accounts for 3.8 million deaths a year. In children and adolescents, the sequence of complication is undesirable. A South Indian study of 368 children and adolescents with T2DM reported retinopathy (26.7%), micro albuminuria (14.7%), neuropathy (14.2%), and nephropathy (8.4%) owing to micro vascular damage. DM imposes heavy economic burden directly and indirectly besides intangible costs.

Even though there is no single cause, family history of DM, male gender, females in puberty, inadequately breast fed babies, thrifty genotype and Asian phenotype play significant role as non- modifiable risk factors. Several modifiable risk factors such as obesity, inadequate physical activity, calorie dense diet with fat, sugar and refined cereals, low consumption of fresh fruits, vegetables, legumes and whole-grain cereals are recognized. A high BMI (> 25Kg/m2), waist circumference (>80 cm in females and >90 cm in males), waist: height ratio (≥0.58), maternal diabetes, high birth weights (> 4.5 Kg) and low birth weights (<2.5 Kg), a carbohydrate based dietary pattern of high glycaemic index foods; hypertension, smoking and alcoholism are linked with

Need for the study

Typically Indians acquire diabetes 10 years earlier than Westerners. One of the most disturbing trends is the shift in age of onset of diabetes to a younger age. India has 21% (243 Million) comprising of adolescent population. Increasing numbers of youth are becoming obese and are at risk of developing T2DM. An estimated 92,000 adolescents between 12 and 19 years of age are having pre diabetes and at risk of progression to disease stage.

A preliminary study among 100 adolescents found poor knowledge of T2DM along with high risk lifestyle. The finding of a preliminary study among adolescents found poor knowledge of T2DM along with high risk lifestyle compelling an urgent need for educating these adolescents. Educational interventions among adults have shown positive outcomes, but few studies on primordial prevention among adolescents are available. Hence the present study was undertaken based on Health Belief Model aimed at prevention of risk factors from childhood by giving awareness on severity, susceptibility and preventive measures of T2DM to modify lifestyle through a Structured Teaching Program (STP).

2.3 Statement of the Problem:

"A study to evaluate the effectiveness of a structured teaching program on knowledge and practice regarding prevention of Type 2 Diabetes Mellitus among adolescents in selected schools of Kerala"

2.4. OBJECTIVES:

i. To assess and compare the pretest and posttest knowledge and lifestyle practice inventory of adolescents related to prevention of T2DM in experimental and control groups attending selected schools in Kerala.
ii. To compare the knowledge and lifestyle practice inventory related to prevention of T2DM among adolescents attending selected urban and rural schools of Kerala
iii. To find the association between pretest knowledge and lifestyle practice inventory related to prevention of T2DM with selected variables of adolescents in experimental and control groups attending selected schools of Kerala.

3. METHODOLOGY

Experimental study with pre-test post-test control experimental groups by quantitative approach was designed. Multistage stratified random sampling was done to select 975 adolescents, studying in 9th standard of 18 selected schools from two districts, who were assigned to control and experimental groups respectively. Investigator prepared pretested, validated questionnaire was used to collect data on knowledge and lifestyle, inclusive of food habits and activity patterns along with bio-physiological and demographic profile and a structured teaching program on T2DM. Tool was subjected to validation by subject experts; CV index 0.98 and Cronbach alpha for internal

consistency ranged from 0.428 to 0.827. The test retest reliability for knowledge questionnaire was r = 0.067 (Pearson Correlation Coefficient). Ethical clearance, administrative permissions, consent from principal and assent from adolescents were obtained. Pre-test was given to both groups; STP was given to experimental group after pre-test, followed by post-test after 30 days to both groups. Data collection took place from 15th June 2014 to 15th January 2015. Descriptive and inferential statistics were employed to analyze the data using SPSS v.18.

4. RESULTS

Section I: Characteristics of study participants

Total 975 adolescents participated in the study; 518 from urban and 457 from rural areas, majority (71.1%) of age 14 years (mean age 13.9 ± 0.55). Girls (52.8%) exceeded boys (47.2%) and Christian (46.3%) exceeded Hindu (30.7%) and Muslim (23.7%) subjects. Parents were mostly high school educated or degree holders. Fathers were mostly unskilled (23.5%) and skilled (20.2%) workers; while 69.5% mothers were unemployed housewives.

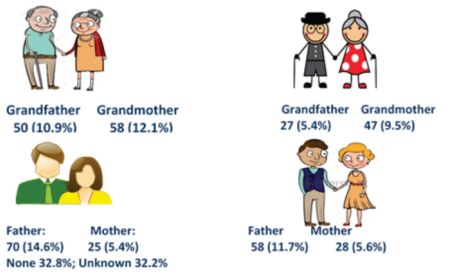

Fig: - 1. Distribution of subjects showing family history of DM group wise

Nearly one third (29.3%) of sample had history of DM in their family, second one third (32.7%) had no DM in their family and remaining (31.3%) were unaware of their diabetic status (Fig:-1).

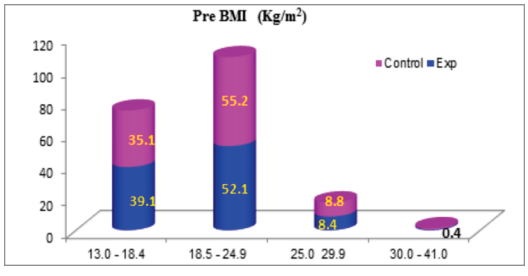

Fig:-2 Distribution (%) of subjects showing BMI value.

Half of the sample had normal BMI values (55.2% control 52.1% experimental);undernourished were 35% in control & 39% in experimental groups. Overweight was alike in both groups; 8.8% control and 8.4% experimental whereas 0.8% subjects in control and 0.4% in experimental group were obese (Fig:-2).

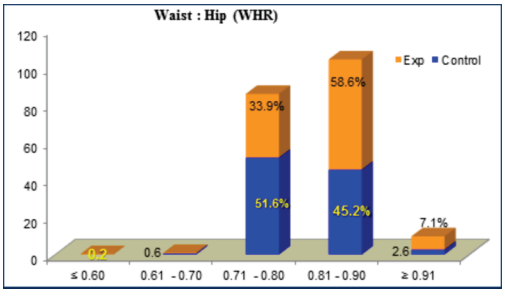

Fig:-3 Distribution (%) of subjects showing WHR values

Correspondingly, Waist: Hip ratio (WHR) showed 42.87% within normal range (WHR < 0.81), 51.69% as overweight (WHR > 0.81, < 0.90) and 4.82% with abdominal obesity (WHR>0.91) while 0.5% was undernourished (Fig:-3).

Section II: Knowledge related to T2DM among adolescents

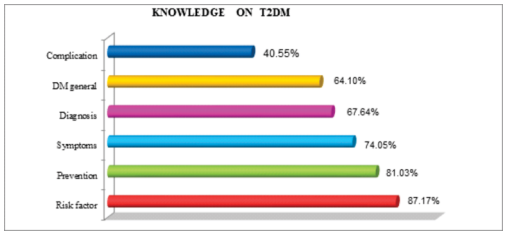

Fig:-4. Knowledge about T2DM among adolescents

(Overall pretest Mean %)

Overall knowledge about diabetes among adolescents found complications were least known (40.55%) while risk factors (87.17%) and prevention (81.03%) were the best known (Fig:-4).

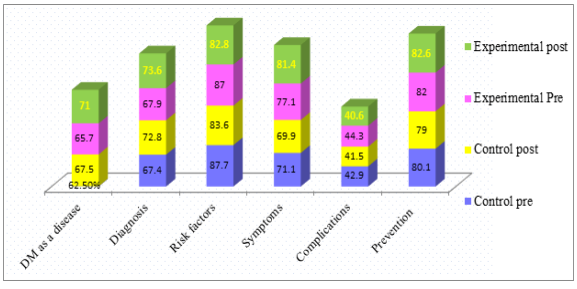

Fig:-5.Distribution (%) of subjects showing pre-posttest knowledge of T2DM by item & group wise.

Awareness about DM as a disease, diagnosis and symptoms improved noticeably after STP among experimental group which was absent in control group. Notably, knowledge about complications did not show any progress after STP among experimental group (Fig-5).

Table-1. Lifestyle practice showing food habits of adolescents during pretest & posttest in experimental and control groups (N=975)

VARIABLES	CONTROL(n=497)		EXPERIMENTAL(n=478)	
	Pre	Post	Pre	Post
	Mean SD	(Range)	Mean SD	(Range)
Food Habits (Overall)	90.0 ±12.34 (42-112)	81.89 ± 12.29 (35-104)	87.64 ±12.01 (38-111)	80.06 ±10.58 (36-104)
Unhealthy Foods	56.50 ± 6.53 (28-64)	48.73 ± 7.32 (17-56)	56.30 ± 6.81 (24-64)	48.92 ± 6.59 (24-56)
Healthy food	32.90 ± 7.39 (12-48)	33.09 ± 7.39 (14-48)	30.56 ± 7.36 (14-48)	30.44 ± 7.20 (12-48)

Similar food habits were observed in both groups; with reduction in unhealthy pattern during posttest while healthy food habits remained stable (Table-1).

Table-2. Lifestyle practice showing activity patterns of adolescents during pretest & posttest in experimental and control groups (N=975)

VARIABLES	CONTROL (n=497)		EXPERIMENTAL (n=478)	
	Pre	Post	Pre	Post
	Mean SD	(Range)	Mean SD	(Range)
Activity pattern (Overall score)	28.65 ± 4.44 (3-39)	29.73 ± 5.88 (3-48.5)	28.81± 4.78 (4-48)	29.91 ± 5.73 (4-53.50)
Healthy Activity	26.46 ± 4.18 (2-35)	28.31 ± 5.53 (3-37)	25.83 ± 4.64 (1-36)	27.89 ± 5.73 (1-38)
Sedentary Activity (HD+WD mean)	2.58 ± .79 (1-13.5)	1.72 ± 1.22 (1-16.5)	2.60 ± 1.59 (1-19)	1.74 ± 1.67 (1-21.50)

Activity pattern was similar in both groups on pretest; control group showed higher score in healthy activity and less in sedentary than experimental group subjects. During posttest, both groups made analogous changes with a decrease in sedentary and increase in healthy activities; score was equal on over all activity (Table-2).

Table-3. Comparison of knowledge and lifestyle practice scores related to prevention of T2DM among adolescents group wise (N=975)

Group	Variables (scores)	Pre Mean SD	Post (Range)	Paired t- value	df	p
Control (497)	Knowledge	7.64 ± 2.11 (0 - 11)	7.78 ± 2.43 (0 - 11)	-1.354	494	> 0.05 [NS]
	Lifestyle	118.28 ± 13.66 (73-145.5)	111.8013.52 (61-139)	8.611	212	<0.001***
EXP (478)	Knowledge	7.89 ± 2.08 (0 - 11)	8.21 ± 2.14 (1 - 11)	-3.064	475	<0.002**
	Lifestyle	115.58 ± 12.54 (62-142)	108.92±12.79 (57-138.5)	10.075	231	<0.001***

*[NS] No significance p>0.05, **Significance at p<0.01, *** Significance at p<0.001*

Experimental group showed highly significant differences in knowledge (p<0.002) and lifestyle (p<0.001) between pre and post test scores. Control group showed significant (p<0.001) change in lifestyle without corresponding gain in knowledge (p>0.05) (Table-3).

Table-4. Comparison of knowledge and lifestyle practices among adolescents from urban and rural areas (Independent t test). (N=975)

SCORES	TEST	URBAN(518))	RURAL (456)	t-value	df	p-value
		Mean ± SD				
Knowledge	Pre	8.00 ± 2.19	8.64 ± 2.23	-4.540	972	.000***
Food(Overall)	Pre	87.14 ± 12.36	89.28 ± 12.67	-2.038	576	.042*
Food healthy	Pre	30.94 ± 7.66	32.44 ± 7.41	-2.883	849	.004**
Activity	Pre	33.96 ± 6.08	117.86 ± 13.5	4.305	970	.000***

*Significant at*P<0.5, **p<0.01, ***p<0.001*

Highly significant (p<0.001) differences was observed in pretest knowledge and overall pretest activity scores between urban and rural subjects; for healthy food habits (p<0.01) and overall food habits (p<0.05) (Table-4).

Table-5. Association of knowledge and lifestyle practice with selected variables group wise

Variable	Pretest score	CONTROL(497)			EXPERIMENTAL(478)		
		x^2 - value	df	p-value	x^2 -value	df	p-value
Age	Knowledge	170.181[b]	55	.000***	55.560[a]	33	.008**
Gender	Knowledge	30.687[b]	11	.001**	25.091[a]	22	.293
Religion	Lifestyle	253.217[b]	276	.834	344.257[a]	282	.007**
Income	Lifestyle	541.822[b]	552	.613	731.586[a]	564	.000***
Maternal occupation	Lifestyle	507.150[b]	552	.914	819.870[a]	658	.000***

*Significant at*P<0.5, **p<0.01, ***p<0.001*

Among the experimental group, lifestyle showed significant association with maternal occupation (p<0.001), family income (p<0.001) and religion (p=0.007) while age had association (p=0.008) with knowledge. In control group, age and gender showed significant (p<0.001) association with knowledge (Table-5).

Table-6. Comparison of Waist: Hip Ratio (WHR) between pre - posttest among adolescents from urban and rural areas in control and experimental groups.

Variable	GROUP	Area(n)	PRE	POST	Paired t-value	p-value
			Mean ± SD			
WHR	EXP (478)	Urban(202)	.836 ± .054	.792 ± .044	11.820	.000***
		Rural (239)	.812 ± .047	.798 ± .045	3.988	.000***
	Control(496)	Rural (215)	.803 ± .042	.784 ± .042	6.890	.000***

****Significant at p< 0.001*

Highly significant (p<0.001) reduction in WHR values was observed among experimental group from urban and rural subjects on posttest and from rural areas in control group (Tab-6).

A stepwise multiple linear regression analysis was done with WHR post as dependent variable and posttest knowledge, food habits, activity, lifestyle, group status (experimental and control), area (urban and rural) as study variables in the regression model. Regression analysis indicated that none of these variables would predict the WHR post.

5. DISCUSSION

Presence of positive family history of DM among one third samples was a striking finding with unhealthy lifestyle among adolescents. Similar finding in a study from Saudi Arabia among 426 non diabetic adolescents found (63.4%) with family history of T2DM supported current results.[28]

Present study found 37.5% undernourished subjects. A study from Goa reported one third (33.3%) among 1015 adolescents as underweight; and from 684 students surveyed, 59.2% reported experiencing hunger due to inadequate food intake, more boys than girls (p<0.001). These findings are congruent with present study. Contrary to this, a study from rural Kerala reported underweight of 3% in boys and 10% in girls.[38] Findings indicate poverty and malnutrition rampant among children across Indian states.

In the present study, normal BMI values were 55.2% in control and 52.1% in experimental group. Overweight was alike in both groups; 8.8% in control and 8.4% in experimental while 0.8% in control and 0.4 % in experimental were obese. Meanwhile undernourished adolescents were around 35% in control & 39% in experimental (Fig.2).

A study among 173 school children of 13 -18 years age group from rural Kerala reported an overall prevalence of normal BMI as 78% boys and 76% girls; obesity as 6% in boys and 8% in girls and overweight as 19 % in boys and 15% in girls – evidently higher rates compared to present study. According to a study from Nepal, 19.0% male and 33.3% female were overweight while the overall obesity was 5.8% according to their waste-to-hip ratio. High prevalence of overweight and obesity even among poorer sections of the society highlights the global obesity epidemic. Present study supported these findings with 51.7% adolescents at moderate risk (WHR > 0.81) and 4.8% at very high risk (WHR ≥ 0.91) for developing T2DM.

Knowledge related to T2DM

Despite fairly better understanding about diabetes, studies have reported low awareness about risk factors, complications and management of DM among adolescents. Holla R et.al from Mangalore reported 57.83% of 600 adolescents knew T2DM could result in complications.[33] [33]A cross-sectional survey among 4333 adolescents in Kuwait found that 55.8% knew about complications. Present study had similar results, but only 40.55% knew about complications.

Several studies reported low awareness about risk factors.[25, 26, 28, 29,] Ansari S. et.al reported inadequate knowledge about risk factors; only 7.3% among 600 university students knew physical inactivity as risk factor, 5.5% and 5.3% knew of family history and obesity as a risk factor of DM.[35] Present study found distinct results: knowledge about risk factor was 87.2%. Such better awareness about risk factors was also reported by another couple of studies.[33, 34] Study among 4333 school children from Kuwait found 63% subjects as aware of risk factors.[41]

Awareness about preventive measures was reported as poor among adolescents.[25, 26, 33,42] Contradicting this, present study found 81.03% awareness regarding prevention of T2DM opposing this. Despite high awareness about T2DM, Mahajerin et al. found a high rate of self-reported risk factors among adolescents.[34] Present study had similar observation.

Knowledge about diabetic complications was least (44.3%) on pretest which did not improve after STP among experimental group (40.6%). Lack of perceived seriousness of the disease and vulnerability of self to developing the disease or its denial may elucidate the situation in the absence of disease. Adolescents who expressed keen interest to learn

and adopt healthy lifestyle had either a parent or another member in their family suffering from T2DM. The human tendency is to resist change until a threat occurs.

Lifestyle practices related to prevention of T2DM

Singh et al from Delhi reported on 510 healthy children of 12- 18years about their dietary habits and activity pattern in relation to risk for NCD. Identified habits include fast food intake more than 3times weekly, extra salt intake and very low (39.4%) consumption of fruits daily and lack of physical activity of at least 60 min a day for three days a week.. Self reports of lifestyle indicated unhealthy food habits and sedentary activities.Several studies have reported unhealthy food habits among adolescents.[49] Present study had comparable findings: intake of packet juice, milk shake, chocolates, bakery items, sweets, fried foods, fast and processed foods and a low intake of leafy vegetables, salads and fruits. Contrasting, a study of 1,440 adolescents from urban school Baroda, reported that 80% children had consumed regular foods; dhal, rice, chapatti and vegetables while 40% missed daily breakfast and one-third of adolescents missed a meal once or twice a week.[50]

Activity pattern

Multiple studies have reported physical activity among adolescent population as less than recommended for age (at least 60 min per day three times a week). Adolescents spend considerable time (>2hrs) in front of screen; TV, computer, tablet, iPod or mobile phone. Screen time was found to have significant ($p< 0.05$) inverse correlation with breakfast, vegetables and fruit intake. Physical activity was found to have significant ($p< 0.05$) positive correlation with fruit and vegetable intake but not with sedentary behaviors.[52]Findings of a qualitative study in Kerala hinted on the impact of cultural beliefs and practices on lifestyle pattern. The belief that leisure-time physical activity depletes one's energy needed for work with females being discouraged from heavy activities in order to focus on household chores and cooking. This notion continues among the younger generation even though fitness is emphasized.Among women, older and urban individuals, Television viewing was reported as the spare time activity after sleeping.[51] Mode of commuting to school is vital in identifying physical activity in motorized societies.[53]Present study findings are comparable; subjects from both study groups spend the leisure time on TV, mobile phone, computer and private tuition. Except a few, majority had motorized commutation to school. Physical activity was confined to walking, cycling, playing cricket or football daily and swimming weekly whereas girls played badminton or did gardening.

Effectiveness of educational intervention on knowledge and lifestyle was found positive. The percentage of subjects who exercised >3 times a week increased from 14.2% to 58.7% ($p<0.001$) after attending the mass awareness regarding benefits of physical activity. The number of subjects who walked >3 times a week increased from 13.8% at baseline to 52.1% during follow-up ($p<0.001$). Present study finding was congruent, a decrease in sedentary and increase in healthy activities was found after teaching with significant differences in knowledge ($p<0.002$) and lifestyle ($p<0.001$).

6. CONCLUSION

Unhealthy food habits, inadequate physical activity and concurrent sedentary activities at disproportionate levels indicate high risk for T2DM in the study population. Despite awareness about risk factors and prevention, potential complications are obscure. The scenario is obscure and intricate because of the socio cultural, economic, religious, familial and ecological factors. The transition to healthy lifestyle requires massive efforts at diverse community levels besides empowering them with adequate knowledge.

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