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A STUDY TO ASSESS THE COST EFFECTIVENESS OF HOME BASED EDUCATION PROGRAMME AMONG CLIENTS WITH DIABETES MELLITUS (DM) AT SELECTED VILLAGES IN KANCHEEPURAM DISTRICT, TAMIL NADU, INDIA

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ABSTRACT: Home based education among clients with diabetes mellitus (DM) by diabetes educator has been cost effective although some educational intervention have strong evidence on cost saving. This study aimed to assess the cost effectiveness of home based education programme on diabetic treatment among clients with diabetes mellitus. Community based randomized controlled trial with experimental design was used in this study. Diabetic subjects who had been undergoing treatment for 3 months in Marai Malai Nagar and 9 villages at Mamandoor were selected by simple random sampling technique. 200 Participants were assigned to the study group, 200 in control group. The study group subjects were engaged in video education program, weekly once 4 sessions and nutritional counseling every 15days 30 mins for 3 months. The overall post interventional result showed from the baseline compared to control group, there was an absolute mean change in direct medical cost (from Rs 2837.05 to 1674.65), cost of investigation (from Rs 319.50 to Rs 261.11), non medical cost (from Rs 369.87 to Rs 110.79), indirect cost Rs. 412.60 to Rs 303.50) with the cost effectiveness of home based education program, and there was significant association found between the cost effectiveness and age, monthly income and housing of the diabetic subjects. Home based education is cost effective and it reduced hospitalization and complications. Health professionals can contribute to tackle the current epidemic of diabetes mellitus, and hence forth the burden of diabetic treatment cost can be reduced.

INTRODUCTION: Diabetes mellitus become an expensive disease in the present scenario in all developing countries.

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Most of the population are ignorant about their disease condition and management. Complications and emergency care of diabetes mellitus lead to economical crisis among clients with diabetes mellitus.

Another important factor is in 2012, the direct medical cost of diabetes in the United States was calculated at around $ 176 billion, with the total cost expenditure of $ 245 billion and the productivity was reduced to $69 billion[1].

The international diabetes federation estimated not there were 382 million people in 2013; more than 60% of the people with diabetes live in Asia [2].

The average cost of treating diabetes complications in the United States average is $ 85,200 effective interventions that prevent or delay type 2 diabetes and diabetes complications might result in reduction of health care cost [3]. The present research was delimited to analyze the cost of diabetic treatment after 3 months intervention on direct medical, direct non medical and indirect cost among diabetic clients [4, 5].

Cost –effective analysis seeks to identity and place dollars on the cost of a program. It then relates costs to specific measures of program effectiveness [6, 7, 8]. Diabetic educators play an important role in education and counseling and thereby cost of diabetic treatment may be reduced. Many clients do not follow the low caloric diet menu and do not practice regular exercise. In India this situation prevails among urban and rural population. Due to lack of travel facilities and family support many individuals are not able to have proper treatment. Ultimately, it lead to uncontrolled glucose level in the blood and it lead to morbidity and mortality among Indian population cost benefit analysis has been an important topic of research. Various studies indicate that there is a high financial impact on society from the cost of diabetic care and treatment [9]. Furthermore, home based education is feasible for the clients to have counseling and glucose assessment in their home environment [10].

Hence forth the cost analysis of home based education will definitely gives an insight on the commitment of medical staffs and clients towards the prevention and control of diabetes mellitus.

MATERIALS AND METHODS: This study aimed to assess the cost benefit analysis on home based education program among clients with diabetes mellitus and to associate the cost benefit analysis with the selected demographic variables. An experimental research design was utilized for his research. The researcher underwent diabetes education training. The study was conducted in the areas of SRM community centres at Maraimalai Nagar and Mamandoor, Kancheepuram district. The study was allocated by simple random sampling technique, sample, n=400 (200 study+ 200 control), the clients who were on regular treatment for more than 3 month for diabetes mellitus, who were willing to participate in the study, and those who were not on regular exercise were included in the study.

The tool used for this study consists of 2 sections**. Section A:** Deals with demographic variables. It consist of demographic profile which includes age, gender, occupation, education status, marital status, monthly income of family, type of Housing, parental history and duration of illness. **Section B:** Structured questionnaire to assess the cost spent by the diabetic clients for their treatment. It consist of 30 structured items on cost variables under direct medical, direct non medical and indirect cost. Cost per unit, total number of unit, cost per day, cost per month were included.

All participants had informed about the aim of the study, the participants was voluntary and their responses would be handled anonymously. After the official permission obtained from the hospital responsible authorities, the pretest was done to both group. Intervention on video education, stretching exercise and nutritional counseling was given for 3 months to the study group. After 3 months post test was done with the same structured oral interview questionnaire. The reliability of the tool was established by using chron – Bach alpha method, the reliability of the tool was r = 0.84 and the tool was found to be reliable to proceed for the main study, confidentiality was maintained throughout the study.

A pilot study was carried out on 10%of the subjects (n = 40) to check and ensure the clarity of the statement and time required to complete the study. After obtaining the subjects consent, the data was collected by the researcher at the client's home. Around 10 clients were interviewed per day, and the filling the questionnaire consumed about 15 – 25 minutes, and the data collection were completed during the period of one year (July 2013 to November 2014).

The data were analyzed using SPSS software and several statistical tests. The two most frequently used levels of significance were 0.05 and 0.01. After completing the data collection, data was

coded, verified, and transferred into a special form to be suitable for computer feeding using SPSS (statistical percentage for social science) version 17.0, to utilize for data entry, statistical analysis and presentation of the results. Analysis of collected data was done through the use of secured statistical test such us paired t test, and multiple regression analysis. For each test the p value of 0.05 levels was used for statistical significance.

RESULTS: Key observation of the subject, the distribution of socio demographic variables between study group and control group Were similar. All the 398 clients were having type 2 DM age 60-69 years were (45.5%) majority of them were females (73.0%) majority of them were illiterate (32.0%), sedentary worker 68.5% majority of them were having the illness for 2-5 years (58.5%). Results are given as mean cost (in rupees) per month. (**Table 1**) reveals in the pretest direct medical cost in study group mean was (2837.05), (SD=1502.30), and the post test cost mean was 1674.65, (SD=884.49), (t=12.73, p=0.001) and it was statistically significant. Were as in the control group mean was (2816.96), (SD=1442.17), and the post test mean was (2758.63), (SD=1577.18), (t=1.31, p=0.19), it was significant. Regarding cost of investigation in pretest, study group mean was (319.50), SD = (314.31) and the post test (261.11), (SD=293.31), (t=7.69, p=0.001) and control group (327.12) (SD=267.00) and in post test (315.35) (SD=265.62), (t=1.44, p=0.16). It is statistically significant in study group after home based education.

Regarding non medical cost in pretest, study group mean was (369.87) (SD=180.81) and the post test mean (221.23 (SD=110.79), (t=15.82, p=0.001). It is statistically significant where as in control group (355.10) (222.83) and in post test (347.53) (229.25), (t=1.40, p=0.17), it is not significant.

Regarding indirect cost in pretest study group mean was (412.60) (SD=334.62) and the post test mean was (303.50) (SD=345.30), (t=6.80, p=0.001). It is statistically significant where as in control group, pre test mean was 421.46 (SD=396.09) and in post test 408.33 (SD=404.06), (t=1.66, p=0.10). It is statistically not significant. Regarding over all monthly cost in pretest, study group mean was 3939.02 (SD=1640.18) and the post test (2460.49) (SD=1182.34), (t=15.57, p=0.001), where the control group mean was (3920.64) (SD=1426.85), and the post test mean (3829.84) (SD=1563.48), (t=1.71, p=0.09). The study group post interventional over all monthly cost is reduced and it is statistically significant.

TABLE 1: COMPARISON OF COST BETWEEN PRE TEST AND POST TEST

Cost variables	Groups	Difference				
		Pre test		Post test		Student paired t test
Direct Medical cost		Mean	SD	Mean	SD	
	Study group	2837.05	1502.30	1674.65	884.49	t= 12.73 p=0.001 significant
	Control group	2816.96	1442.17	2758.63	1577.18	t= 1.31 p=0.19 not significant
Cost of Investigation	Study group	319.50	314.31	261.11	293.31	t= 7.69 p= 0.001 significant
	Control group	327.12	267.00	315.35	265.62	t= 7.69 p= 0.16 not significant
Non Medical Cost	Study group	369.87	180.81	21.23	110.79	t=15.82 p= 0.001 significant
	Control group	355.10	222.83	347.57	229.25	t= 1.40 p=0.17 not significant
Indirect cost	Study group	412.60	334.62	303.50	345.30	t= 6.80 p= 0.001 significant
	Control group	421.46	396.09	408.33	404.06	t= 1.66 p= 0.10 not significant
Overall Cost/Month	Study group	3939.02	1640.18	2460.49	1182.34	t= 15.57 p= 0.001 significant
	Control group	3920.64	1426.85	3829.84	1563.48	t= 1.71 p=0.09 not significant

Results are expressed as mean cost (in rupees) per month.

TABLE 2: MULTIPLE REGRESSION ANALYSIS ON ASSOCIATION OF COST AND SOCIO DEMO GRAPHIC VARIABLES BETWEEN COMBINED GROUP

Model	Bet & co efficient	Std error	+	Sig – P value
Constant	848.029	549.23	1.544	0.123 not significant
Age (<50 vs >50)	210.924	101.938	1.981	.049 significant
Gender (female vs male)	270.663	160.373	.441	.660 not significant
Occupation (sedentary vs others)	-33.484	37.711	-.888	.375 not significant
Duration (<1 yr vs >1 yr)	-20.325	86.660	-.235	.815 not significant
Education status (Literate vs Illiterate)	-29.908	50.502.	-.592	.554 not significant

Marital status (Married vs widow)	-127.336	102.512	-1.562	.119 not significant
Heredity (No vs Yes)	-128.257	82.109	-1.562	.119 not significant
Monthly Income (SRS.3000 vs CRS.3000)	137.213	65.398	2.439	.016 significant
housing (Pucca vs kutcha)	156.947	68.835	2.280	.023 significant
Cost reduction score (Intervention vs control)	1076.33	104.621	9.155	P= 0.001 significant

Significant p<0.05

Table 2: The multiple regression analysis on association of cost and socio demographic variables between combined group reveals age (p=0.049), monthly income (p=0.016), housing (0.023) were significant and the cost reduction score was significant in the intervention group (p=0.001) than control group.

DISCUSSION: In this present study video education program and nutritional counseling was target to the participants. The result of this study support the cost effectiveness of home based education program among clients with diabetes mellitus and there was significant reduction found in the direct medical, direct non medical and indirect cost. Also the result of the study proved that around 50 participants stopped their medication, medication dosage was reduced to once a day, foot ulcer was healed, complications and hospitalization of the clients were reduced. The clients were able to maintain their blood glucose with diet menu plan and adherence to regular exercise regimen. The finding of the present study shows there was significant reductions in overall cost reduction from baseline mean (RS 3939.02 to 2460.49). Also the researcher was able to educate the family members and the self help group leaders, health workers in the selected setting.

This finding goes in congruence with Lir *et al*., 2010 intensive interventions to prevent type 2 diabetes among persons with impaired glucose tolerance compared with standard life style care and it was very cost effective [11]. Cost benefit analysis and cost- effectiveness analysis are technique that relates the costs of a program. It seems to be straight forward analysis can be applied any time before, after or during a program implementation, and it can greatly assist decision makers in assessing a program's efficiency [12].

The researcher found the cost of intervention per clients was around (RS 900-1000) including the blood strips, instruments, travel, and food expenses for the researcher and co researchers. Also the time spend per clients in study group reached four hours for this 3 months intervention whereas only one hour was spend for the control group clients.

In accordance with these finding Bahia LR *et al.*, 2011, Boren SA *et al.*, 2009 stated that direct medical cost included expenses with medication, diagnostic test, procedures, blood glucose test strips and office visits. Their result showed the greatest portion of direct cost was attributed to medication (42.2%), cost increased with duration of disease, level of care and presence of chronic complications[13, 14]. Ian Duncan (2009) states that it diabetes educators are increased both cost and quality of life will be improved [15]. Also this study results is consistent with the study of Balamurugan *et al*., (2006), christensen *et al.*, (2004), stated reduction in medical cost *i.e*. (hospitalization cost and improvement in nutrition knowledge, and cost savings[16, 17, 18, 19].

The burden on cost of diabetic management play a biggest role in families of low income, the average cost of treatment varies according to dosage of medication and insulin usage from (Rs300/-Rs3000).The finding also demonstrated statistically significant association between the cost effective analysis and the participants age, monthly income and pucca housing, at (p=0.001) in the study group.

CONCLUSION: The present study high lights the cost reduction of home based education program with video teaching and exercise among the study group clients with diabetes mellitus. Therefore follow up and commitment from diabetic educators and health workers is essential to reduce the burden of diabetes mellitus treatment cost to the clients. The study suggests policy makers to allocate resources to tackle this disease, thereby mortality and morbidity from diabetes mellitus can be reduced in India.

Guarantor Statement: T.S is the guarantor of this word and has such had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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CONFLICT OF INTEREST: The authors declared no competing interests.

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