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# An interventional study on the health promoting behaviours of adults with diabetes

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## KEYWORDS

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Nursing intervention;  
Diabetic nursing care;  
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Health;  
Health promoting behaviours;  
Diabetic patient education

**Summary** The purpose of this study is to evaluate the effectiveness of a nurse-directed intervention (NDI) in terms of improvement in the Health Promoting Behaviours (HPB) of adults with diabetes. An evaluative approach with a quasi-experimental non-equivalent pretest post-test control group design was used. The sample consisted of 30 adults with type 2 diabetes mellitus in the experimental group and 30 in the control group of the two private hospitals selected by convenience non-random sampling technique. The main instruments used were "Health Promoting Behaviours Structured Questionnaire Rating Scale" and "Demographic and Clinical Proforma". The NDI was a planned, systematic, organised and validated diabetic patient education programme with visual aids, designed for instructing adults with diabetes with regard to improving their HPB. The findings of the study showed that the mean posttest HPB scores of the experimental group were significantly higher when compared with the control group for the total HPB scale ( $Z = 6.26$ ); and the health and functioning, social-economic, psychological/spiritual and family subscales  $Z = 6.597, 4.92, 5.01,$  and  $5.42$ , respectively. The findings indicate effectiveness of the NDI in terms of significant improvement in the HPB of the adults with diabetes. Therefore nursing interventions, like education is a necessity for diabetes management.

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## Introduction

### Background of the study

Diabetes is one of the most frequently occurring chronic diseases in the world affecting nearly

2–4% of the population (WHO, 1998, p. 88). In recent years attempts have been made to prevent the complications due to diabetes through strict treatment regimen, reduction of risk factors, modification of the life style behaviours, control of diabetic status and an overall improvement of health promoting behaviours (HPB). Research studies have also shown that life style factors such as diet, physical activity, physical and mental stress have a direct as well as

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confounding impact on the glucose metabolism and insulin sensitivity which could influence the development of type 2 diabetes (Ramachandran et al., 1999, p. 301).

Approximately 93–95% of Indians suffer from type 2 diabetes due to factors such as, sedentary life style, highly refined calorie intake, stressful urban life, smoking, hypertension and obesity (“Indians genetically prone to diabetes”, 1999, p. 4). Its prevalence has been found to be approximately 2% in the rural and 3% in urban areas with local peaks as high as 8% with urbanization, changing lifestyles and nutritional habits. The WHO Health Report (1998, p. 91) quotes that in India diabetes directly causes approximately 38,000 deaths per year and may contribute to as many as 300,000 deaths annually, including many from heart disease and kidney failure. According to the pharmaceutical company Novo Nordisk (“Indians genetically prone to diabetes”, 1999, p. 20), Indians have a dubious distinction of having the highest number of diabetics in the world as 25–30 million and if the predictions of the WHO come true, the number will swell to over 57 million by 2025.

The concept of HPB are used to illustrate varied terms ranging from positive actions, taken by the individual to promote health, such as healthy nutrition, balanced diet, regular exercise, keeping fit, elimination of waste toxins, rest and sleep; to the avoidance of negative or risk behaviours, such as alcohol, drug, or tobacco use. Pender et al. (1990) defined HPB as a “positive approach to living, having a multidimensional pattern of self-initiated behaviours and perceptions that serve to maintain or enhance the level of wellness, self-actualisation and personal fulfilment of the individual” (p. 73).

The HPB is further described as any actions or behaviours taken by the person with diabetes for daily living that are conducive to health and well being varying in different socio-cultural and physical environment. Taken in the broadest context of multidimensional health, HPB include both positive health-oriented actions and negative avoidance behaviours that minimise specific threats to health and well-being. Thus HPB are identified as the fundamental concept for gaining insight into the health practices that encourage the adults with diabetes to accept the prescribed health promotion activities through patient education. In this study HPB is defined as the activities or practices for maintenance of life and health by adults with type 2 diabetes as measured by a structured questionnaire rating scale.

## Objectives of the study

Prepare and validate the nurse-directed intervention (NDI) for the improvement of HPB among adults with type 2 diabetes. Determine the HPB of adults with diabetes before and after the NDI as measured by HPB structured questionnaire. Evaluate the effectiveness of the NDI in terms of improvement in the HPB of the adults with diabetes.

## Review of literature

Haisch and Remmele (2000) examined the effectiveness and efficiency of ambulatory diabetes education programs by comparing standardised diabetes education program in the general practice and specifically developed diabetes education programme in specialist diabetes practice. The mean weight and glycosylated hemoglobin of all groups decreased as expected. However, the patients of the general practices achieved more lasting reduction of three objective parameters. All patients stated impairments of their quality impaired, but the patients of the specialist programme practice felt more impaired. The motivational support programme achieved only few positive results. The standardised diabetes education programme of the general practices and the more intensive and expensive diabetes education programme achieved equally valuable results. Regarding time and expenses, the standardised diabetes education programme was a more efficient method for patient education.

Benjamin et al. (2000) implemented clinical practice guidelines on staged diabetes management for diabetes care using problem-based learning technique with a controlled trial for a 15-month follow-up in two outpatient clinics. The findings showed that at 9 months, there was a mean  $-0.90\%$  within-subject changes in HbA1c in the intervention group, with no significant changes in the control group. The 15-month mean within-subject change in HbA1c of  $-0.62\%$  in the intervention group was also significant. Among intervention patients, those with the poorest glycemic control at baseline realized the greatest benefit in improvement of HbA1c. The intervention group also exhibited significant changes in physician adherence with American Diabetes Association standards of care, annual preventive screening procedures, referrals to nutritionists and diabetic educators, aggressive pharmacological regimens, combination therapy with insulin and oral therapy compared to

the control group. Clinical practice guidelines are an effective way of improving the processes and outcomes of care for patients with diabetes. Problem-based learning is a useful strategy to gain physician support for clinical practice guidelines.

Deichmann et al. (1999) demonstrated improvement in diabetic care after a Physician Education Project by measuring the quality of diabetic care as indicated by HbA1c testing frequency and HbA1c values. After the intervention, there was statistically significant improvement in HbA1c from 17.7% to 33.9%. The percentage of patients with a current HbA1c value significantly improved from 31.3% to 47.6%. The percentage of patients with both current HbA1c values and office visits significantly increased from 29.4% to 47.6%. The median (HbA1c < 8%) significantly improved from 43.8% to 56.9%. The study revealed that HbA1c testing was underused but that after a quality improvement initiative, a significant increase in testing use could be achieved. The quality improvement initiative also resulted in significant improvements in glycaemic control.

Diminerio et al. (1999) compared the efficacy of outpatient and inpatient diabetes education programs on medical, cognitive, behavioural, and psychosocial outcomes for newly diagnosed paediatric patients. Using three large, tertiary medical centres in the United States, a sample of 32 children newly diagnosed with diabetes and their parents were recruited. No statistically significant differences were found between the groups. The outpatient group used emergency precautions on the adherence measure, roles on the family functioning measure, maintaining family integration on the parental coping measure, and disposition on the children's roles on the family functioning measure, maintaining family integration on the parental coping measure, and disposition on the children's coping instrument. Findings support the safety and efficacy of the outpatient program method.

Kulkarni et al. (1998) determined acceptance and ease of the nutrition practice guidelines for type 1 diabetes mellitus and its influence on dietician practices (new practice guidelines and traditional methods) and patient outcomes for a 3-month period. Dieticians in the practice guidelines group spent 63% more time with patients and were more likely to do an assessment and discuss results with patients than dieticians in the usual care group. Practice guidelines dieticians paid greater attention to glycaemic control goals. Levels of HbA1c improved at 3 months in 21 (88%) of practice guidelines patients compared with 16 (53%) of usual care patients. Practice

guidelines patients achieved statistically significant and greater reductions in HbA1c level than usual care patients (1.00 versus -0.33). This difference was clinically meaningful. Use of guidelines resulted in changes in dietician practice and produced greater improvements in patient blood glucose outcomes at 3 months compared with usual care.

Vijayalakshmi (1998) studied the effectiveness of a structured educational programme on diabetes in pregnancy and its management for diabetic pregnant women in terms of gain in knowledge, control of glycaemic levels and delivery outcome. A pre-experimental design was adopted with pre-test and posttest for selected 16 diabetic pregnant women. A structured educational programme was developed to give teaching to the selected women. The major findings of the study were: mean post-test knowledge score was significantly higher than the mean pretest knowledge  $t_{(15)} = 10.09$ . The mean pretest blood sugar level was significantly higher than the mean posttest blood sugar taken one week prior to the delivery,  $t_{(15)} = 3.74$ . The chi-square test for follow-up visits and glycaemic levels of the women was significant,  $\chi^2 = 0.15$ . 50% of them had delivered after 28 weeks of gestation and 88% underwent caesarean delivery. 40% had mild rise in random blood sugar, which was found to be significantly associated with maternal hyperglycemia, hyperbilirubinemia and birth weight of newborns.

Faulker (1996) described the responses of school-age children with diabetes and the influence its on self-care. Semi-structured interviews of 27 individuals living in a rural south-eastern Missouri and Illinois were tape-recorded. The results showed that the major responses of the children included reminiscing the: time of diagnosis of diabetes; changing the diet; scheduling daily routines; coping; managing diabetes; worrying about insulin reactions; encouraging blood-tests and self-injections. The self-care activities of the children included: learning about diabetes, administering insulin injections, monitoring glucose levels, maintaining dietary practices, exercising, assuming responsibility and decision-making ability. The major categories for influencing self-care activities were reminding themselves and making sure that the daily regime of insulin, diet, and blood testing was maintained. The study shows that children with diabetes concentrate more on improving their health behaviours to maintain their diabetes status.

Brock (1978) investigated the effectiveness of the learning activity package (LAP) as a method for diabetic patient education. The pre and post

test scores of experimental group of four patients, newly diagnosed as diabetic were taught about their disease utilising a LAP and were compared with those of a control group which consisted of four patients who had been diagnosed as diabetic for more than a year. There were statistically significant differences between the knowledge, diet therapy, recognition of complications and hygiene care posttest score means of the experimental group receiving the LAP and the control group which did not receive the LAP ( $t = 2.689, 2.817, 2.393, 10.331$ , respectively). Thus LAP can be seen as a diabetic educational agent in promoting adequate healthy behaviours for adults in managing their diabetes.

A comparative experimental study to assess the effectiveness of two planned teaching approaches, individual and group instruction for developing self-care abilities of type 2 diabetes patients was carried out by Sharma (1989) in Safdarjung hospital, Delhi. Three sample groups of type 2 diabetes patients, two experimental and one control group consisting of 30 subjects each were selected. The significant findings of the study were: both the experimental group subjects who received individual and group instruction gained significantly higher knowledge of the disease and self-care in diabetes than the control group subjects. The experimental group II (group instruction) obtained significantly higher scores on knowledge than the experimental group I (individual teaching) and control group. Both the experimental groups achieved higher ability scores in doing urine testing for sugar than the control group. Significantly, more patients who received individual planned teaching had reduced glycemic levels and of these 28.3% attained normoglycemic state. The findings indicate that diabetes educational programmes for promoting health behaviours of the patients in India can be more effective by using the group teaching approach.

Sharma (1998) conducted an evaluative research with a pretest posttest control design to evaluate the effectiveness of two types of patient teaching programmes, i.e., auto-instructional and agent-initiated instruction strategies for developing self-care ability among type 2 diabetes patients in a hospital in Delhi. Three similar groups of 50 diabetic patients each were assigned to two experimental groups and one control group through systematic random sampling. The findings revealed significantly higher knowledge and skill gain and re-education in stress levels in the two experimental groups. The main findings of the study were the mean posttest knowledge, skill and attitude scores of the experimental group 1 and 2 were

significantly higher than their mean pretest scores. Their mean posttest stress and glycaemic levels were significantly higher than their mean pretest scores. There was a positive significant correlation between knowledge, attitude, and skill and inverse relationship between knowledge and stress. This study shows that adults with diabetes in India need ongoing health education in the hospitals to help them improve their health behaviours.

Thus the review of literature shows that adults with diabetes need to focus on their health promotion behaviours rather than their illness, treatment or self care for diabetes. The clients afflicted with diabetes were faced with decision-making about insulin control, diet, exercise, skin care, etc. Studies showed that independent of the physical aspects of diabetes, the other health dimensions like, psychological, social, family and spiritual aspects formed an important factor in determination of HPB. There are influencing and constraining factors to the effectiveness of diabetes education in India due to the long term changes in adults HPB, e.g. socio-cultural, contextual, personal motivation, economic status etc. that might influence their outcomes.

## Research methodology

### Research approach

In view of the nature of the problem, objectives and hypotheses of the study, an evaluative approach with a quasi-experimental non-equivalent pretest post-test control group design was planned. The study was conducted in two separate private hospital settings, so that contamination of the subjects and selection bias was reduced. The experimental group was selected from a hospital in Goa and the control group was selected from a hospital in Mangalore. These two places were shown for the study, as there is very little variation between the socio economic, cultural, mores and lingual norms between the two groups of adults with type 2 diabetes. There was no randomisation of the samples so that comparison could be made between the two close by regions and people.

After the sample selection, pretest was administered to the experimental and control groups. Then the treatment (NDI) was given to the experimental group. After one month NDI was once again reinforced to the experimental group. After three months of the pretest, the posttest was given to

both the groups. The groups were not selected randomly but were treated identically except for the experimental treatment (NDI). No attempt was made to restrict the usual care and teaching instructions given by the hospital staff to the control group. The control group had some exposure to the routine diabetic advice given in the hospital, which was not controlled for ethical reasons. Thus no true control group existed in the study. Hence a quasi-experimental research design was accepted as it lacked randomisation and a true control.

### Development of the study instruments

The instruments constructed for the study to generate the necessary data were: HPB structured questionnaire rating scale. Demographic and clinical proforma for the background data. Demographic characteristics includes age, sex, marital status, education, occupation, income and habits of the adults with diabetes. Clinical characteristics includes duration of diabetes, type of treatment, sources of information, body mass index, blood pressure, blood sugar levels and the type of complications present in the adults with diabetes.

A structured questionnaire rating scale was developed to assess the HPB of the adults with diabetes before and after the administration of the nurse directed intervention. Content blue print of the HPB tool was prepared based on the four broad domains and the items in each domain were developed. The HPB questionnaire consisted of four domains with 40 items categorised as follows: "Health and functioning" domain included 27 items distributed in five areas: diet (8); exercise (3); medication (5); hygiene (7) and prevention of complications (4) items. "Social and economic" domain had 4 items, "Psychological and spiritual" domain had 6 items and "Family" domain consisted of 3 items.

The HPB questionnaire was initially prepared with the current perceptions and prevailing practices of the adults with diabetes as given in the construction of the tool. It consisted of 50 items along a five point likert rating scale was constructed and given to a team comprising of 14 experts, i.e., two experts from each specialty areas (medical, diabetologist, endocrinologist, psychologist, counselor, sociologist, primary health care members) along with the blueprint for content validity. Based on their suggestions, the required modifications were made in the tool. The final tool contained 40 items after incorporating the suggestions given by the specialists. There was 100%

"strong agreement" for 40 out of 50 items. As suggested by 7.14–14.48% of the expert validators, the remaining 10 items scrutinized was found to be repeated, irrelevant or non-applicable to the adults with diabetes. These items were omitted from the tool and the total number of the items in the final tool was 40. The validated tool was then subjected to reliability test.

A pretest of the HPB tool was done on 30 diabetic individuals in a private hospital with adults with diabetes who possessed similar characteristics to those proposed for the larger study. This tryout of the tool was done to determine the clarity, presence of ambiguous items, use of medical terms and to ensure feasibility of the tool. All the items were clearly understood and their responses were also found to be appropriate. The HPB rating scale tools were administered to 30 adults with diabetes admitted in the in-patient units of a private hospital with the specified sample criteria to test the reliability (internal consistency). Coefficient of internal consistency of the total and each domain of the tool was computed by Cronbach-alpha method. The internal consistency of the total HPB tool was 0.87. The reliability of the 4 domains of the HPB was: health and functioning 0.70, social and economic 0.70, psychological and spiritual 0.73 and the family domain 0.74. As the HPB tool was found to be valid and reliable, it was used for the purpose of the study. (The HPB tool can be provided on request.)

### Development of the nurse directed intervention for adults with diabetes

In this study, the NDI is defined as a planned, systematic, organised and validated diabetic patient education programme, designed for instructing adults with diabetes with regard to improving the HPB. The first draft of the NDI for improving the HPB of the adults with diabetes was prepared on the basis of the blue print, literature available on the topic, actual health practices and beliefs of adults in India, and the objectives to be achieved. Appropriate teaching-learning activities were planned to make teaching more interesting and receptive. The learners' capacity to absorb information was considered and the content was made simple, clear, and comprehensive. The areas covered in the NDI were: Introduction to diabetes: definition, role of insulin, mechanism of diabetes, clinical features and the clinical investigations. Health and functioning domain consisted of: goals of management, management areas regarding diet, exercise, medications, hygiene, and the prevention

of short and long term complications. Social and economic domain consisted of socialisation and leisure. Psychological and spiritual domain consisted of relaxation and stress management. Family domain consisted of support and participation.

The purpose and actual use of criteria rating scale for the NDI was with a view to establish a standard consensus in determining the reliability of the NDI content organization, selection, presentation, language, visual aids, feasibility, adequacy and practicability of the NDI as a diabetes education programme to improve the HPB of the adults with diabetes. The criteria rating scale was developed with 26 items spread in the above-mentioned broad criterion areas. The rating scale had four response columns, i.e., strongly agree, agree, partially agree and disagree.

The draft of the NDI along with the criteria rating scale and the sample visual aids were submitted to fourteen experts for content validity. Out of the 26 items, 25 items were strongly agreed by all (100%). The modifications required for one item were made and the rest of the content was retained in the NDI. This had been added to the final draft. During the pilot study it was found that the intervention plan required two-hour sessions with the full co-operation of the adults with diabetes.

The final design of the NDI included teaching–learning activities such as lecture, discussion, demonstration, questioning, illustration, problem solving, brain storming sessions, experiences and feedback processes. The main objective of the NDI was to improve the HPB of the adults with diabetes.

The content of the nurse directed intervention were related to the meaning of diabetes (causes, characteristics), the role of insulin in the body (action, use), pathophysiological changes (mechanism and salient features) in diabetes, and clinical features (signs and symptoms: early, late and severe). The regular and annual laboratory investigations (blood, urine, lipid, cholesterol, kidney), goals of therapy for managing diabetes, diet plan (rules, guidelines, food exchange role, food exchange list, food groups, balanced diet, calories of each food items, sample menus for vegetarian and non-vegetarian for various calories, body mass index, height–weight chart, kinds of food avoided, limited and generously for consumption) were explained as individual diet plans were taken into account. The importance of life long dependence on medications (oral, insulin; in terms of actions, side effect, sites, types, rules, monitoring, compliance, complications) and aerobic exercises (nature, activities, bodily changes, types, rules,

duration, avoid, precautions, complications) were described and demonstrated.

Monitoring blood sugar levels (aim, reason, metabolic control, rationale, methods, demonstration, blood sugar/glycosylated chart), care of the body (hygiene of skin, hair, nail, oral, feet, check, dos and don'ts), manifestation and recognition of complications (low blood sugar, high blood sugar; in terms of definition, causes, features: early, later, severe, treatment, prevention) were explained while individual experiences were taken into account. Prevention of complications (heart, eyes, kidney, nerves, dental, infection; in terms of warning signs, monitoring, measuring, control and prevention, recognition, guidelines of management) was described. Psychological support (mental mechanisms: goal-oriented, problem solving, decision making, logical reasoning skills, emotional mechanisms), exercises, leisure, hobbies, rest and sleep, and spiritual aspects were discussed. Socialization (job, finance, leisure, social support, friends, social exposure, connections, mobility, travel, relaxation, management of stress, adjustment at work space, family care (support by family members, functions, get together, responsibilities and marital life) were dealt with.

The final draft of the NDI was prepared with appropriate visual aids incorporating the suggestions given by the expert validators. The NDI design was finalised with various visual aids such as pamphlets on the guidelines for managing diabetes mellitus and prevention of complications; handouts on sample diabetes diet, calorie of each food items, major food groups, height–weight chart; charts, flip cards and posters on the management of diabetes, diet, exercise, medications, insulin care, testing with blood glucometer, body and feet care, hypoglycemia, hyperglycemia, long term complications prevention and treatment, psychosocial therapy, stress management, specimens and life objects regarding various anti-diabetic medications, blood and urine testing measures, insulin technique, and slides on the various sites of insulin administration, maintenance of diabetic card and planning calorie diet.

The NDI was given to the experimental group in a closed hospital conference room with adequate lighting, temperature, and ventilation. As the various topics of the NDI evolved the visual aids were unfolded and dwelt at length on each one. Each session consisted of one hour per day. Thus the whole session took 3 hours and the subjects were recalled the next day for the continuity of the process, discussion and feedback.

## Setting, population, sample and sampling technique

The sample subjects of the study refer to all the adults diagnosed with type 2 diabetes attending the daily medical out patient department (OPD) of the two selected private hospitals during the period of the study. All the subjects who volunteered to participate in the study were chosen as they registered in the OPD until a sample size of 30 was reached. A convenience non-random sampling technique was used to select the adults with diabetes who frequented the OPD because of inadequate availability of the sample according to the sampling criteria. As the diabetic population was homogeneous on the critical attributes, i.e., the demographic and clinical characteristics used in the study, the risk of bias was minimal. The 30 samples from one selected private hospital was taken as the experimental group and 30 adults with diabetes from another private hospital were taken as the control group. Both the hospitals had similar characteristics in terms of client care, facilities and technology. There was very minimal or no diabetes education/instruction given by the health care members in both the hospitals. Nearly all the adults with type 2 diabetes had not attended or participated in previous diabetes educational programmes. The sampling criteria included adults with diabetes who were more than 20 years of age, could understand, read, write and communicate in English, willing to participate in the study and the intervention plan and those willing to attend the out patient clinic for follow up.

## Pilot study

A pilot study prior to the main study was conducted with the validated tool and intervention to assess the feasibility of the study, plan of the statistical analyses and flaws in the design. A convenience sampling technique with 30 samples, i.e., 15 in the experimental group and 15 in the control group, selected as per the specified criteria. The pilot study findings did not show any major problems in the design of the study. The adults with diabetes were able to understand the items given in the HPB tool and were able to follow the intervention programme. The timing and the length of the intervention plan were found to be feasible, adequate and convenient to the adults with diabetes. The data analysis plan was made based on the pilot study.

## Data collection procedure

Formal administrative permission to conduct the study was obtained from the Medical Superintendents of the two private hospitals. In order to obtain open and honest responses from the subjects, they were informed about the purpose and usefulness of the study. Assurance of anonymity and confidentiality was also given to them. An informed consent was obtained from the subjects indicating their voluntary participation in the study. The investigator administered the questionnaires to each subject of the out patient setting in a separate room allotted for the study purpose till the specified number of the samples was obtained. The respondents read the instructions in the questionnaires and ticked their responses in the columns provided. The data was collected before the nurse directed intervention and after the intervention. The data collection was terminated after the posttest data was collected from the adults with diabetes. The experimental group participants accepted the NDI administered to them. The participants were thanked for their participation and co-operation in the study.

In the experimental group setting at a private hospital in Goa, ten diabetic patients attended the daily OPD. These patients were informed about the study and the intervention plan scheduled for the specific days. Ten patients were conveniently selected for each day (two-day sessions of one hour each) from among those who attended the OPD and who fulfilled the sampling criteria. After the pretest and the intervention plan, the patients were asked to attend the reinforcement NDI programme after one month on the specific days and two months later for the posttest. There was no sample mortality. In the control group setting nearly 15 diabetic patients attended the daily OPD at a private hospital in Mangalore. Based on the inclusion criteria the control group samples were chosen from this setting in the same way as the experimental group.

## Data analysis and interpretation

### Description of sample characteristics: demographic characteristics

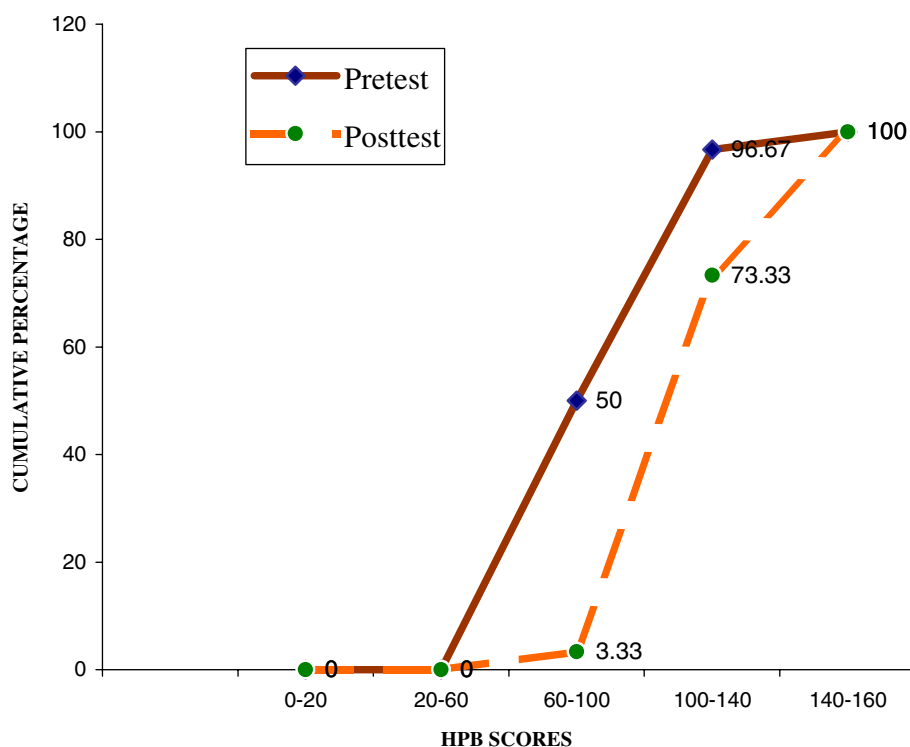
The experimental group participants (33.3%,  $n = 30$ ) were above 61 years when compared to the control group (3.4%,  $n = 30$ ). Majority of the adults with diabetes in the experimental group

(73.3%) and control group (70%) were males. In the experimental group (86.7%) and control group (76.7%) majority of the adults with diabetes were married. Majority of the adults with diabetes in the experimental group (70.1%) and the control group (73.4%) had education above higher secondary, where the maximum were graduates in the experimental group (46.7%) and intermediate in the control group (36.7%). More adults with diabetes in the experimental group (40%) were unemployed or retired when compared to the control group (3.3%). Nearly one third of the adults with diabetes in the experimental group (30%) and half of the adults with diabetes in the control group (50%) were consuming alcohol. Smoking habits seemed to be more in the experimental group (70%) than the control group (50%). The demographic characteristics show that there were some differences between the two groups of study in terms of age and occupation.

### Clinical characteristics

While 36.7% of the adults with diabetes in the experimental group had diabetes for more than 10 years, in the control group there were only 3.3% adults with diabetes in this category and

most of the adults (76.7%) had diabetes for 5–10 years. Very few of the adults in the experimental group (3.3%,  $n = 30$ ) and the control group (6.7%,  $n = 30$ ) were on diet, oral diabetics and insulin. Majority of the adults with diabetes in the experimental group (60%) and the control group (56.7%) received little information regarding diabetes care from the health professionals. Both the groups had no attendance/participation in any previous diabetes education programs. In the experimental group and in the control group majority of the adults with diabetes (80% and 56.7%, respectively) had a normal body mass index (range 18–25). Only 6.7% of the adults with diabetes in the experimental group and 10% in the control group had a high blood pressure (more than 140/90 mm Hg). While 43.3% (13 out of 30) of the adults with diabetes in the experimental group had a high blood sugar, in the control group 93.3% (28 out of 30) of the adults with diabetes had a high blood sugar. More than half the adults with diabetes presented with diabetic eye complications (63.3% and 56.7%) in the experimental and the control group. Many of the adults with diabetes in the control and the experimental group had kidney (46.33% and 43.33%) and nerve (50% and 36.6%) complications, respectively.



**Figure 1** Cumulative percentage frequency of the total HPB scores of the diabetic adults in the experimental group.



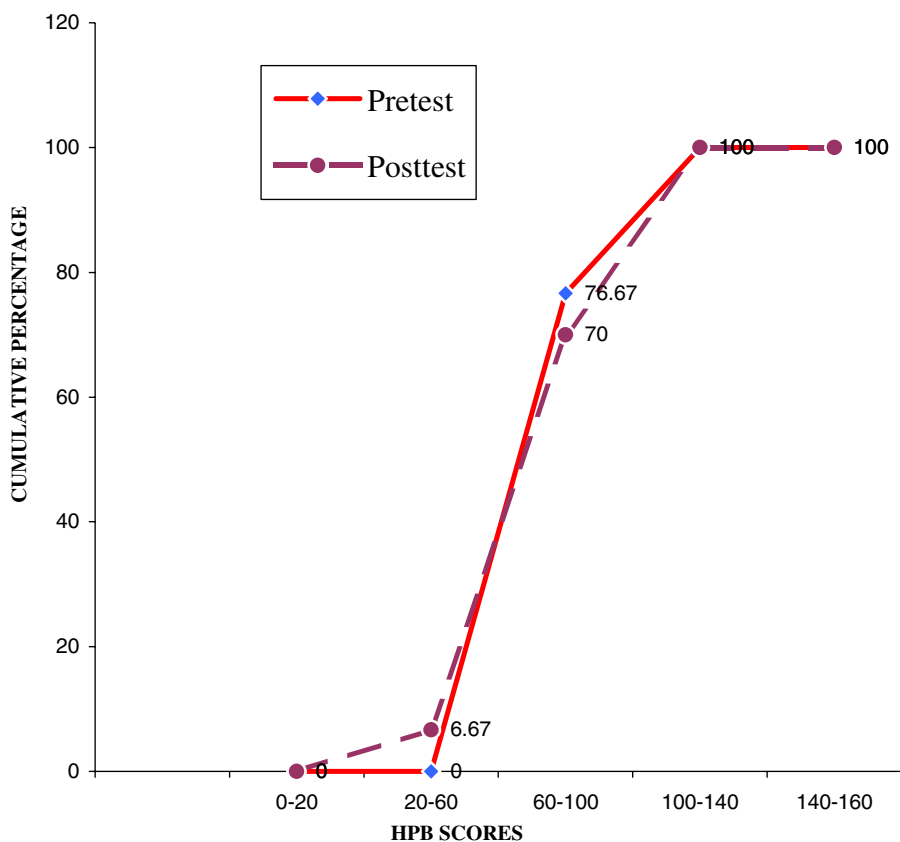


Figure 2 Cumulative percentage frequency of the total HPB scores of the diabetic adults in the control group.

### Description of health promoting behaviours of the adults with diabetes

#### Distribution of the HPB scores of the adults with diabetes

Cumulative percentage curves (Ogives) in Figs. 1 and 2 was plotted by taking the cumulative percent of frequency of the HPB scores of the adults with diabetes in the experimental and the control group on the y co-ordinate axis. The ogive in Fig. 1 show that in the experimental group, the posttest ogive lies to the right of the pretest ogive over the entire range, indicating that the posttest HPB scores are consistently higher than the pretest scores. The distance separating the two curves at various levels shows an improvement in the HPB after the NDI.

As seen in Fig. 2 the HPB scores of the control group did not show similar findings as the experimental group. The posttest ogive lie very close to the pretest ogive indicating that there was no major change in the posttest HPB when compared to their pretest scores. This shows that there was no improvement in the posttest scores with the usual care to the adults with diabetes in the control group.

Inferential statistical methods were used to analyse these differences. The data was tested for normality and the data was not found to be nor-

mally distributed. Hence nonparametric tests such as Mann Whitney's *U* test and Wilcoxon's Signed Rank test were used to compare the results in independent and paired data, respectively.

#### Difference between the HPB mean pretest and posttest scores in the experimental and control group

H01: There is no significant difference between the HPB mean pretest and the posttest scores of the experimental group of the adults with diabetes exposed to NDI.

H02: There is no significant difference between the HPB mean pretest and the posttest scores of the control group of the adults with diabetes exposed to the usual care.

In the experimental group as seen in Table 1, the mean difference of 33.93 ( $n = 30$ ) was statistically significant,  $Z = -4.72$  for the total HPB scores. The mean differences of the health and functioning, social and economic, psychological and spiritual, and family domains was found to be significant statistically,  $Z = -4.76, -4.07, -3.13, -3.92$  and  $p < 0.05$ . Hence H01 was rejected and the difference between the HPB mean pretest and the posttest scores of the experimental group of the adults with diabetes was found to be true.

**Table 1** Mean, mean difference and *Wilcoxon signed ranks test* Z values of HPB scores of adults with diabetes in both the groups

Scale	Statistics <i>df</i> = 29	Experimental group ( <i>n</i> = 30)		Control group ( <i>n</i> = 30)	
		Pretest	Posttest	Pretest	Posttest
Total scale	Mean	100.2	134.13	90.36	92.36
	MD	33.93	2.0		
	Z	−4.72 <sup>***</sup>	0.66 <sup>ns</sup>		
Health and functioning	Mean	63.73	94.06	55.73	59.66
	MD	30.33	3.93		
	Z	−4.76 <sup>***</sup>	−0.49 <sup>ns</sup>		
Social-economic	Mean	10.13	13.2	9.26	8.8
	MD	3.07	0.47		
	Z	−4.07 <sup>***</sup>	−1.48 <sup>ns</sup>		
Psychological-spiritual	Mean	16.33	20.2	15.63	14.16
	MD	3.87	0.47		
	Z	−3.13 <sup>***</sup>	−1.34 <sup>ns</sup>		
Family	Mean	8.56	11.03	8.6	7.66
	MD	2.47	0.93		
	Z	−3.92 <sup>***</sup>	−1.61 <sup>ns</sup>		

Note. MD refers to mean difference. <sup>ns</sup> = not significant. <sup>\*\*\*</sup>  $p < 0.001$ .

Thus it is inferred that the increase in HPB scores in the posttest shows the effectiveness of the NDI.

In the control group, a mean difference (2.0) of the total HPB scores was not significant,  $Z = -0.66$ . In the control group, the mean difference of the health and functioning (3.93), social and economic (0.47), psychological and spiritual (0.47), and family (0.93) domains were not found to be statistically significant,  $Z = -0.49$ ,  $-1.48$ ,  $-1.34$  and  $-1.61$ , respectively.  $H_0$  was accepted. Thus the usual care had no influence over improvement of the HPB of the adults with diabetes.

#### Differences of mean posttest HPB scores between the experimental and control groups

The data presented in Table 2 for the HPB mean pretest scores indicate that the total mean HPB scores in the experimental group (100.2) was higher than that of the control group (90.36) but was not statistically significant,  $Z = 1.75$ ,  $p > 0.05$ . In all the subscales ‘‘health and functioning, social and economic, psychological and spiritual, and family’’ domains, the mean pretest score of the experimental group was slightly higher than the mean pretest score of the control groups. But all these were not

**Table 2** Mean and *Mann–Whitney test* Z values of HPB pretest scores between the experimental and control groups *N* = 60

HPB scale	Groups	Mean	Z
Total scale	Exp	100.2	−1.75 <sup>ns</sup>
	Con	90.36	
Health and functioning	Exp	63.73	−2.25 <sup>ns</sup>
	Con	55.73	
Social-economic	Exp	10.13	−0.48 <sup>ns</sup>
	Con	9.26	
Psychological-spiritual	Exp	16.33	−0.07 <sup>ns</sup>
	Con	15.63	
Family	Exp	8.56	−0.13 <sup>ns</sup>
	Con	8.6	

Note. Exp refers to experimental group. Con refers to control group. <sup>ns</sup> = not significant.

**Table 3** Mean and Mann–Whitney test Z values of posttest HPB scores between the experimental and control groups  $N = 60$ 

HPB subscales	Groups	Mean	$t, df = 58$
Total scale	Exp	134.13	-6.26***
	Con	92.37	
Health and functioning	Exp	94.07	-6.597***
	Con	59.67	
Social-economic	Exp	13.2	-4.92***
	Con	8.8	
Psychological-spiritual	Exp	20.2	-5.01***
	Con	15.16	
Family domain	Exp	11.03	-5.42***
	Con	7.62	

Note. Exp refers to experimental group. Con refers to control group.  
\*\*\*  $p < 0.001$ .

statistically significant,  $Z = -2.25, -0.48, -0.07, -0.13$  and  $p > 0.05$ , respectively for each domains. Therefore it can be said that both the groups are nearly similar though there were few differences in the mean.

H03: There is no significant difference between the HPB mean posttest scores of the experimental group and the control group of the adults with diabetes.

In the posttest as shown in Table 3, the mean HPB scores of the experimental group were significantly higher when compared with the control group for the total scale, and the health and functioning, social-economic, psychological/spiritual and family subscales. The differences were tested statistically using Mann–Whitney test and the Z values were found to be significant,  $Z = -6.26, -6.597, 4.92, 5.01, \text{ and } 5.42$  for the total HPB scale and respective subscales. Hence H03 was rejected, as the total HPB scale and all the subscales were statistically significant.

To summarize the results from all the non-parametric tests, it can be concluded that the NDI had an influence in improving the HPB scores of the adults with diabetes in the experimental group.

## Discussion, Conclusions, Implications and Limitations

### Discussion

Brock (1978) concluded that patients participating in the learning activity package (LAP) method demonstrated significantly more knowledge of diabetes mellitus  $t = 2.69$ , performing urine tests  $t = 0.46$ ,

carry out special diet therapy prescribed  $t = 2.82$ , administering insulin  $t = 1.19$ , recognizing complications  $t = 2.34$ , and implementing good hygienic care  $t = 10.33$  on the posttest scores than patients who did not participate in the LAP method. Sharma (1989) found that the NIDDM patients' knowledge of the disease, self-care skills, attitude and stress reduction in diabetes was significantly higher in the groups who received individual and group instruction than the control group. The pretest and posttest mean knowledge and skill scores for the two experimental groups were found to be significant. The diabetic patients whether exposed to auto or agent initiated instruction significantly attained higher posttest scores in knowledge, skill, attitude and stress reduction compared to the pretest levels. The present study also shows that the NDI was useful in term so improving the HPB of the adults with diabetes.

Padgett (1991) and Rubin (1991) indicates that agent initiated group instruction was an effective method of teaching diabetic patients as they had significant knowledge and skill. Zink (1998) found that 82% of the experimental and the control group with diabetes indicated social support system adequate to meet their needs, and 76% of the diabetics maintained appropriate diet and weight reducing behaviours. Weinstock (1998) found that the diet and aerobic exercises in obese women achieved a mean weight loss of 13.8 kg, which was associated with decreased insulin levels. Significant foot problems like gangrene, foot ulcers were present in 27.2% of the diabetics and low scores were more common among those with complications. This study also emphasizes a significant improvement in the HPB of the adults with diabetes.

## Conclusion

Some of the conclusions of the data can not be made realistically as the sample size was very small and there was a chance of sampling errors and Hawthorne effect. But from the findings it can be partly inferred that an increase in the HPB mean post test and the mean gain scores show the effectiveness of the NDI in terms of improvement of the HPB, i.e., changes in the cognitive, conative and affective domains of the experimental group of the adults with diabetes exposed to the intervention programme as compared to the control group. The purpose of the NDI fulfilled the objectives set for the adults with diabetes for managing their diabetes, indicating a true change in the diabetic patient's comprehension, attitude and integration of health behaviours in daily life. The metabolic clinical gain associated with this change is not within the scope of the present research study.

This implies that nursing interventions like teaching, educating and demonstrating self management skills for diabetes helps the diabetic patients to comply with their treatment regimen. The NDI influenced the improvement of the four areas of the health and functioning subscale of the adults with diabetes, showing that diet, exercises, medications, hygiene, prevention of complications are important activities for self-care management of diabetes, that an individual patient has to master for optimum health. This also implies that nursing interventions like teaching self-management skills for diabetes care (like planning a diet, administering insulin, carrying out urine tests, participating in social and family activities, discussing problems with family members, spiritual activities) helps the diabetic patients to adapt and comply with their treatment regimen. A theme that also emerged from the data was on the importance of psychological-spiritual, social and family domains and the integration of these domains as important dimensions to healthy living.

## Nursing implications

The outcome of the nurse directed intervention for diabetic patients can be determined in terms of improvement in the HPB as it allows nurses to target concerns and issues that are appropriate with respect to the recipient of care, i.e., the diabetic person as the new health system evolves. As psychosocial, spiritual and family life contribute to the HPB of the adults with diabetes, nurses need to focus attention on the family and social system

and involve the family members and significant others to participate in the care process. Nursing personnel must also understand that NDI offers the patient the potential therapeutic value of participation in a group.

The nurse administrators' role in the health care delivery system is to collaborate with the community, public health nurses, and diabetes nurse educators for facilitating the process of community education and health promotion. Besides diabetic camps, use of self-help groups and adult to adult teaching programmes would be desirable keeping in view the advantages of the group interaction for discussing experiences and issues related to diabetes self care, problem solving assistance, decision making abilities and group support. Research studies on the multidimensional concept of the HPB need to be explored, which would help in understanding the factors and dimensions associated with HPB.

## Limitations recognised in the study

Non-random assignment of the subjects to both the groups and non-probability sampling limits the generalizability of the study findings. The experimental group, which consisted mostly of the elderly and retired subjects (maybe due to absence of a randomised control), would have had exposure to various communication media in the past.

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