Computers in providing nutrition education to osteoporotic patients: An Ardent need

RENU PALIWAL AND AARTI SANKHALA

With a frightening increase in the prevalence of non-communicable diseases and their high therapeutic cost it becomes indispensable that the vast pool of existing knowledge be made available to the ultimate beneficiaries with the help of most widely accepted modern technological tool *i.e.* via computers as they have played an excellent role in growth and development knowledge assessment tool comprised of questions on different aspects (general facts, prevalence, etiology, clinical manifestation, role of diet and exercise in the management of the disease) was framed after reviewing the literature extensively. The maximum attainable scores were then distributed into three categories (good, average and fair). The knowledge assessment tools so developed were tested for its reliability by selecting 10 disease subjects purposively and the tool was found highly reliable (r=0.94). With the use of this system there was a significant increase in the knowledge of the users in males as well as in females of the disease group with a total per cent improvement of 82.98 in osteoporotic subjects. The mean pre test scores was 9.7±3.29 and the mean post test scores were 17.75±2.57. All the patients were falling in the fair range of knowledge and they were all shifted to the category of good after the exposure of the developed system. Hence, it can be concluded that software has definitely played a crucial role in improving the knowledge level of the users.

Key Words : Computers, Nutrition education, Non- communicable diseases

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INTRODUCTION

By the dawn of the third millennium, non-communicable diseases are sweeping the entire globe, with an increasing trend in developing countries where, the transition imposes more constraints to deal with the double burden of infective and non-infective diseases in a poor environment characterized by ill-health systems. By 2020, it is predicted that these diseases will be causing seven out of every 10 deaths in developing countries (Boutayeb and Boutayeb, 2005).

In the beginning of the agricultural period, population size and density increased significantly. The reasons for the increase are complex. It was assumed that the abundance of food would have led to a better-nourished and healthier population with a reduced rate of mortality and a continuous and steady increase in population size. The shift from gathering and hunting to agriculture also produced an increase in infectious and nutritional disease rates. Infectious diseases have been the leading cause of death throughout most of human existence. During the last centuries and especially during the last decades, however, many demographic, social, economic, ecological and biological changes led gradually to a decrease in occurrence of communicable

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diseases This development included the expansion of education, rising income, industrialization, urbanization, improved medical and public health technology with a subsequent rise in non-communicable diseases.

Besides diabetes and other diseases one more major problem is also silently stepping in across the globe and is termed as "silent thief". Cut to the bone it's often called silent because one never knows when it happens, thief because it robs us of a very vital body constituent. Osteoporosis (porous bones) is increasing as the world's population grows and ages. Although osteoporosis affects millions of people everywhere, awareness about the disease is still low and doctors often fail to diagnose it. (*www.economictimes.com,* 2008).

Expert groups peg the number of osteoporosis patients in India at approximately 26 million (2003 figures) with the numbers projected to increase to 36 million by 2013. In a study among Indian women aged 30-60 years from low income groups, BMD values at all the skeletal sites were much lower than values reported from developed countries, with a high prevalence of osteopenia (52 %) and osteoporosis (29 %) thought to be due to inadequate nutrition (Bax, 2007).

In women over 45 years of age, osteoporosis accounts for more days spent in hospital than many other diseases, including diabetes and myocardial infarction. The life expectancy of both men and women is increasing in India. However, this increased longevity is associated with increased burden of age related morbidities including osteoporosis, which is a generalized bone disease characterized by low bone density and micro architectural deterioration of bone tissue. This may result in the increased risk of the spine, hip and forearm fractures. It is known that in the near future developing countries like India may expect the occurrence of hip fractures in epidemic proportions and will put high burden with increase in economic and social costs (Shatrugna *et al.*, 2007).

Osteoporosis can have several causes out of them heredity, sex, ethnicity are not under control, there are some causes that are slightly under control such as estrogen levels, low body weight. Then there are few more factors that are totally under control which includes dietary habits, smoking, alcohol etc. (Anonymous, 2008).

In the 21st century one cannot think of life without computers. There is enormous information on computers that has no boundaries and can be accessed worldwide. Nutrition educators demonstrated that enhanced communication can improve the health and well being of population (Rao, 2000). Computer technologies are providing viable means of exchanging nutrition information among professionals and informing and influencing the public. Software for public presentations allows nutrition educators to enhance their talks by incorporating pictures, sounds, animations, text and videos.

METHODOLOGY

The methodology followed during the course of conduction of work has been explained under the following heads:

Locale of the study:

The study was conducted within the municipal limits of Udaipur city to ensure maximum contact with the subjects.

Study population:

To accomplish the objectives of present piece of research work, study population was selected separately for different stages mentioned below:

Stages of sample selection:

– Reliability testing of knowledge assessment tool (10 osteoporotic patients).

– Gain in knowledge assessment (20 osteoporotic patients).

Sample selection criteria :

Subjects were selected purposively for each stage and criteria taken into account for both the stages have been mentioned here below:

– Subject above the age of 30 years.
– Subject of either sex.
– Subject suffering from osteoporosis
– Subject willing to participate and co-operate during the course of investigation

Operational design :

Study was conducted in three phases so as to accomplish the objectives:

PhaseI:Development of knowledge assessment tool:
Reviewing the literature :

In depth review of textbooks, journals, internet and

magazines was made so as to frame questions in each aspect of the disease. The points were studied carefully and suitable options to each question were placed so as to help the subject in arriving at correct answer.

Formulation of knowledge assessment tool :

A tool for was finally formulated by allotting 1 score to each correct answer and 0 to each wrong answer. The questionnaire comprised of closed ended questions on general facts, prevalence, etiology, clinical manifestations, role of diet and exercise in the management of disease.

Validity and reliability testing :

The validity was tested by a panel of 18 experts (6 nutritionists, 6 dieticians, 3 doctors and 3 patients) for each disease on a five point scale (5- very good, 4 – good, 3- average, 2- poor, 1- very poor) ranging from very good to very poor for content, sequence and overall presentation. In case of language and relevance to topic the scale ranged from very simple to very difficult and totally relevant to totally irrelevant, respectively.

For reliability split half technique was used. This was accomplished by administering scale to 10 subjects. They were then divided into two sets one with odd numbered subjects and the other with even number of subjects. Then the scores of the odd numbered subjects were correlated with the scores of the even numbered subjects.

Phase II: Development of software :

Preparation of manuscript for software development:

Information pertaining to the different areas of the project or diseases was collected from different literature sources. The collected content was then segregated into different headings *i.e.* prevalence, types, symptoms, risk factors, complications, investigative values, role of diet and exercise in the management of the disease.

Development of software :

Planning and development of software was carried out at College of Home Science, Udaipur. The software was developed with the finally developed manuscript using Microsoft Visual Studio 2005 and database was developed using Microsoft Access. Above developed knowledge assessment tool was utilized in the software to assess the knowledge of the users.

The software was divided into 7 sections:
Section 1: Create profile section
Section 2: Risk assessment section
Section 3: Knowledge assessment section
Section 4: Biochemical profile/ biophysical profile section
Section 5: Intake calculator section
Section 6: Activity calculator
Section 7: About disease section: This section is the theoretical side of the system, here user get information about disease, types, etiology, role of diet and exercise in the management of the disease, myths and facts.

Evaluation of the software :

Panel of 18 experts from various fields were invited to rate the content, continuity, sequence, graphical presentations, audio recording, visual quality, pictorial presentations, language, relevance to topic, calculations, practical utility and overall presentation of each disease sections.

Phase III: Gain in knowledge assessment :

A total of 20 subjects were contacted for the present study. Subjects were selected on the basis of pre-determined criteria and information about general profile was collected using data collection tool.

Pre-test score collection :

Above developed knowledge assessment questionnaire was used for pre test score collection. It was distributed to the subjects to assess their present level of knowledge and they were asked to answer the questions and were then collected from them. The scores so obtained were totalled.

Exposure to the software :

The subjects were exposed to the software at their work spot/ homes/ offices/ parks as per their choice. Exposure was repeated twice or thrice as desired or requested by them.

Post-test score collection :

After exposure the same set of questionnaire with new blank answer sheets was again distributed to collect the post-test score.

Analysis of data:

Pre-test, post-test experimental design was used to assess gain in knowledge of the subjects.

The data was statistically analyzed as per the objectives. General information among the subjects was expressed as percentage.

OBSERVATIONS AND ASSESSMENT

The paper has been divided into two phases:
Phase I: Development of knowledge assessment tool
Phase II: Gain in knowledge assessment

Phase I: Development of knowledge assessment tool:

Knowledge assessment tool was developed for appraising the knowledge level of the patients. The validity was tested by a panel of 18 experts for each disease and a MWS was obtained above 4 for most of the parameters. Suitable modifications suggested by the panel of experts were finally incorporated. In order to find out the reliability of the tool, the reliability co-efficient of the scale was calculated. The tools were found highly reliable (r=0.94).

Table A : Distribution of scores on the basis of level of knowledge			
Disease	Good (Grade A)	Average (Grade B)	Poor (Grade C)
Osteoporosis	17-25	9-16	0-8

Osteoporosis knowledge assessment questionnaire:

1. Osteoporosis refers to the disease of the ——
   a. Bone
   b. Kidney
   c. Liver
   d. Heart
2. Osteoporosis is defined in terms of decline in ————-
   a. Bone mineral density
   b. Bone calcium density
   c. Lipid profile
   d. Blood glucose levels
3. ————-is also known as " Silent epidemic"
   a. Diabetes
   b. Osteoporosis
   c. Heart disease
   d. None of the above
4. Osteoblasts are——————————
   a. Bone forming cells
   b. Bone destroying cells
   c. No relation with bone
   d. Hemoglobin formation cells
5. Osteoclasts are——————————
   a. Bone forming cells
   b. Bone destroying cells
   c. No relation with bone
   d. Haemoglobin formation cells
6. Osteoporosis leads to ——————--- bone that is more compressible like a sponge and dense like a brick.
   a. Porous
   b. Strong
   c. Hard
   d. None of the above
7. Approximately ——-—————— million hip fractures occur every year worldwide.
   e. 1.6 million
   f. 1.8 million
   g. 2.0 million
   h. 2.2 million
8. —————————-- are common symptoms of osteoporosis.
   a. Hump back appearance
   b. Pain in legs
   c. Lose height
   d. All of the above
9. T- Score in the range of ——————- indicates osteopenia.
   e. > 2.5
   f. -1 to -2.5
   g. <-1
   h. <-2.5
10. Peak bone mass or maximum bone mineral density occurs by the age ——————
    a. 20
    b. 25
    c. 30
    d. 35
11. The greater the body mass, the —————— —————— the bone mineral density.
    a. Lower
    b. Greater
    c. No effect
    d. Don't know
12. —————————— are common

risk factors of osteoporosis.
a. Low body weight and deficient diet
b. Limited exercise
c. Menopause
d. All of the above

13. Estrogen deficiency in post menopausal women —————————-ability of bone destroying cells.
a. Increase
b. Decrease
c. Don't know
d. No effect

14. ————————- hormone plays an important role in maintaining calcium levels in the blood.
a. Parathyroid hormone
b. Growth hormone
c. Insulin
d. Thyroid

15. Preventive approach in Osteoporosis includes ———————————————
a. Healthy nutrition
b. Avoiding alcohol and smoking
c. Regular weight bearing exercise
d. All of the above

16. Diet in osteoporosis should be high in ——— ————————————-
a. Fat
b. Sodium
c. Calcium
d. Carbohydrate

17. RDA of calcium for adult men is —————
a. 400 mg
b. 1200 mg
c. 1000 mg
d. 1400 mg

18. ——————————— minerals play an important role in preventing osteoporosis.
a. Calcium
b. Phosphorus
c. Boron
d. All of the above

19. ———————— leach calcium from bones.
a. Sodium
b. Fat
c. Caffeine
d. a and c

20. Food rich in calcium is———————————
a. Milk and milk products
b. Pulses
c. Cereals
d. Nuts

21. ————————————————— is a richest source of phosphorus
a. Milk and milk products
b. Nuts and oilseeds
c. Sugar
d. Fat

22. ——————————-vitamin is required to absorb calcium in the gastrointestinal tract.
a. Vitamin D
b. Vitamin A
c. Vitamin C
d. Vitamin K

23. ———————————— Vitamin is obtained from the sun.
a. Vitamin D
b. Vitamin A
c. Vitamin C
d. Vitamin K

24. ———————————————— mineral is the Shadow partner of calcium.
a. Magnesium
b. Manganese
c. Phosphate
d. Zinc

25. Caffeine in coffee ——————————————— urinary calcium output.
a. Increase
b. Decrease
c. No effect
d. Don't know

Phase II: Gain in knowledge assessment :

A pre-test, post-test experimental design was used. The system covered all the important aspects of the disease for disseminating knowledge on different components of the disease from theoretical as well practical point of view.

Pre-post data so obtained were analyzed using paired 't' test and results have been presented here under:

Information about subjects:

A total of 20 patients were selected purposively for the present study. Information pertaining to the general profile of the subjects was gathered about the subjects.

Reliable and valid knowledge assessment tool was used to assess the gain in knowledge of the subjects.

The information gathered from individual respondents on different aspects has been suitably classified below to depict a clear picture of the population under study:

Table 1 depicts the distribution of patients on the basis of gender. It shows that majority of the patients were females (70 %).

Table 1 : Distribution of subjects on the basis of gender

Gender	Osteoporotic patients
Male	6 (30.00)
Female	14 (70.00)
Total	20

Note: Values in parentheses denote percentage

Table 2 throws a light on the age range of the selected patients. Non-communicable diseases usually occur in 4th and 5th decade of life due to many controllable or uncontrollable risk factors. Likewise majority of the present study subjects were in the age range of 40-70 years.

Table 2 : Distribution of subjects on the basis of age group

Age (Years)	Osteoporotic patients		
	Male	Female	Total
21-30	0 (0.00)	0 (0.00)	0 (0.00)
31-40	0 (0.00)	0 (0.00)	0 (0.00)
41-50	2 (33.33)	5 (35.71)	7 (35)
51-60	2 (33.33)	3 (21.42)	5 (25)
61-70	2 (33.33)	6 (42.85)	8 (40)
71-80	0 (0.00)	0 (0.00)	0 (0.00)
Total	6	14	20

Note: Values in parentheses denote percentage

Table 3 presents data on anthropometric measurements of the patients. Mean BMI in subjects was found to be of above normal range. Asian Indians are considered more prone to the occurrence of NCDs. Table 4 depicts that 60-85 per cent of the patients were crossing the border of normal BMI in disease.

Table 3: Anthropometric measurements of the subjects

Anthropometric measurements	Osteoporotic patients (Mean±S.D)
Weight (kg)	65.55±8.78
Height (cm)	159.87±4.17
BMI (kg/m^2)	25.66±3.544
Waist circumference (cm)	92.75±11.50
Hip circumference (cm)	105.9±8.789
Waist- hip ratio	.087±.070

Note: Values in parentheses denote percentage

Table 4 : Distribution of subjects on the basis of BMI

BMI (kg/m^2)	Osteoporotic patients		
	Male	Female	Total
<18.5	0 (0.00)	1 (7.14)	1 (5.00)
18.6-19.9	0 (0.00)	1 (7.14)	1 (5.00)
20-22.9	0 (0.00)	1 (7.14)	1 (5.00)
23-24.9	2 (33.33)	1 (7.14)	3 (15.00)
>25	4 (66.66)	10 (71.42)	14 (70.00)
Total	6 (30)	14 (70)	20 (100)

Note: Values in parentheses denote percentage

Gain in knowledge assessment:

Knowledge assessment tool developed for the purpose was used here so as to collect the pre and post-test scores of the subjects. Table 5 presents the scores obtained by different disease subjects prior and after exposure to the system. To determine the efficacy of the system on patients, a pre-test, post-test experimental design was used and gain in knowledge of the patients was assessed.

Perusal of Table 5 reveals that before exposure to the system the pre test scores were 9.7±3.29 and the subjects with these scores were either in poor or average category of knowledge but after exposure they all were shifted to good category of knowledge. These findings reflect that majority of the subjects were able to understand the content. The reason might be the new learning experience through computers. In addition content on disease was supplemented with videos and pictures so as to enrich it, as well as ease in understanding.

Table 5 : Effect of system on the knowledge gain

Patients		Pre-test (Mean±S.D)	Post-test (Mean±S.D)	t value	Per cent improvement
Osteoporotic	M	10.28±2.21	17.71±1.88	11.4*	72.27
	F	9.53±3.77	17.76±2.94	8.50*	86.35
	T	9.7±3.29	17.75±2.57	11.96*	82.98

*indicates significance of value at P=0.01   NS=Non-significant

The beneficial effect of nutrition education as observed in the present study is in conformity with the findings of the study undertaken by Srivastava *et al.*,2005, on the effectiveness of video film produced to impart micronutrients related knowledge to rural women. It was found that the aid was effective in imparting nutrition education to women regarding prevention and control of anemia and vitamin A deficiency. It was observed that mean scores increased greatly at post exposure stage when compared to pre exposure stage.

Mageshwari and Sunitha (1995) developed a software namely 'Diet Advisor' on obesity for its management. Computer aided counseling was imparted to the subjects using the developed software. The results of pre test and post test computer counseling with the help of KAP questionnaires on male and female subjects indicated significant gain in knowledge in both males as well as females. The body weight of the sample before and after counseling showed significant reduction (Jain and Verma, 2009).

Findings of another study undertaken by Kavadia, 2001 to assess the effectiveness of audio visual educational package on hypertensive patients shows that there was significant gain in knowledge among all the patients after exposure to the educational package. The video cassette was found to be conducive learning tool fro all the study subjects.

Nutrition Pathfinder a CD-ROM programme was developed by Robertson and Zalles, 2005. The goal of the self directed CD-ROM simulation was to encourage students to understand the role of food and activity in their personal growth and development. The evaluation demonstrated that the program achieved its desired outcome to positively impact student's knowledge, attitude and behaviour about nutrition and physical activity. Almost half (49 %) reported eating less extra foods, more grains (44 %) and more milk and dairy products (40 %).

LITERATURE CITED

Boutayeb, A. and Boutayeb, S. (2005). The burden of NCDs in developing countries. *Internat. J. Equity Health*, **14** (1) : 2-4.

Jain, Shruti and Verma, Subhanshini (2009). Role of dietary intake and calcium supplementation on serum calcium levels and bone mineral density of osteoporotic women. *Asian J. Home Sci.,* **4** (2) : 296-300.

Kavadia, R. (2001). Acquisition of nutritional knowledge by hypertensive patients through an audio visual educational package. M.Sc. Thesis, Maharana Pratap University of Agriculture and Technology. Udaipur, RAJASTHAN (INDIA).

Mageshwari, U. and Sunitha, V. (1995). Development of a software and its impact on weight reduction. *Indian J. Nutr. & Dietet.*, **32** : 238-240.

Rao, A. (2000). Computer in nutrition education. *Nutrition,* **34** : 10-13.

Robertson, T.P. and Zalles, D.R. (2005). Nutrition education programe. Nutrition pathfinder. *J. Nutr. Edu. Behav.*, **37** : 41-42.

Shatrugna, V., Kulkarni, B., Kumar, A., Rani, U. and Balakrisha, N. (2007) . Early onset of osteoporosis in women from the low socio – economic group – role of nutrition, Nutrition news, NIN, 28, No.4 Oct.

Srivastava, S.L., Kumar, A.R. and Yadav, N. (2005). Effectiveness of video film produced to impart selected micronutrient related knowledge to rural women. *J. Commu. Stud.*, **22** (11) : 70-73.

■ **WEBLIOGRAPHY**

Anonymous (2008). Causes of Osteoporosis. *http://www.spineuniverse.com.*

Bax, A. (2007). Osteopenia Initial Stages of Osteoporosis and Low Bone Mineral Density. *www.bonehealth.org*

http://www.economictimes.com,2008.