

Impact of Nutrition Education on Knowledge and Haemoglobin Status of Hill Women in Uttarakhand State of India

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ABSTRACT

Introduction: This study aimed to examine the impact of the use of single vs. combination of media on nutritional knowledge and haemoglobin status of women in a rural hill area in Uttarakhand State, India. **Methods:** Women from three villages were selected randomly and divided into three groups namely, print media group (n=59), multimedia group (n=53) and control group (n=111). The print media group was exposed to nutrition education through the use of calendars on anaemia for 60 days; the multimedia group was given nutrition education through a combination of media including calendars, video films, and group discussions for 60 days. **Results:** At pre-exposure stage, 62.7% of the women in the print media group, 67.9 % of the multimedia group, and 66.7 % of the control group had a low nutrition knowledge level. After exposure, the print media group and the multimedia group showed a significant rise in nutrition knowledge, with the multimedia group scoring significantly higher than the print media group. Overall, 69.1% of the women were anaemic with mean haemoglobin concentration of 10.74±0.86 g/dl. A non-significant rise in mean haemoglobin concentrations in the experimental groups was found at post-exposure stage. **Conclusion:** Calendars and video films are effective in increasing nutrition knowledge of illiterate hill women. Use of mass media programmes of longer duration should be encouraged to combat the nutritional problems of rural communities.

Keywords: Anaemia, haemoglobin, multimedia, nutrition education, print media

INTRODUCTION

Anaemia is a problem of serious public health significance, given its impact on psychological and physical development, behaviour and work performance (Bentley & Griffiths, 2003; McClung *et al.*, 2009; WHO,

2010). It is the most prevalent nutritional problem in the world today (WHO, 2008). In India, two-thirds of women of child bearing age are estimated to suffer from iron deficiency anaemia (NFHS-3, 2010). Reports indicate that 19 % of all maternal deaths in the country are attributed to anaemia (Govt

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of India, 2004). India was the first developing country to take up a National Programme to prevent anaemia among pregnant women and children. The National Anaemia Prophylaxis Programme of iron and folic acid distribution to all pregnant women in India through the primary health care system was evolved and implemented from 1972, so that the vast majority of pregnant women, who never seek health care, could benefit from this outreach programme. But these national programmes to control and prevent anemia have not been successful (Kapur, Agarwal & Agarwal, 2002; ICMR Taskforce, 1989). There is no significant decline in the prevalence of anaemia in the country. The National Family Health Survey-3 conducted in 2005-6 (NFHS-3, 2010; Lahariya & Khandekar, 2007) reports of increasing prevalence of anemia in women, since the National Family Health Survey-2 in 1998-99.

Lack of knowledge on the dietary requirements, sources and consequences of iron deficiency are important contributory causes for the widespread occurrence of anaemia among vulnerable sections of the population in the developing countries. Experiences from other countries in controlling moderately-severe anemia serve as a guide to the adoption of long-term measures. Nutrition education is important to improve dietary intake in people who receive needed macro/micro nutrients as protein, iron and vitamins like folic acid, B₁₂, A and C etc. for hemoglobin synthesis (Vijayraghavan, 2002). The WHO (2009) has emphasised that mass information and awareness programmes should be organised to alert governments and communities about the importance of health and nutrition.

The media serves as the most popular source of nutrition information for the public (Contento, 2010). Hence nutrition education through appropriate communication procedures is an important tool to increase awareness of the people. The study was undertaken with the objective of developing nutrition education material on nutritional

anaemia and to study the impact of the developed nutrition education material on anaemia-related knowledge and haemoglobin status of rural women living in the hill regions of India.

METHODOLOGY

This study was conducted in three villages of the hill areas of Uttarakhand state of India. The villages selected were in Bhimtal block of Nainital district which is situated in the lower parts of Kumaon hills and is characterised by long and severe winters, a short summer and heavy rainfall. Institutional Review Board (IRB) approval was obtained for the study.

Sample selection

The Economics and Statistics Officer of the district Nainital was contacted to obtain the number of villages and their populations. The Bhimtal block of Nainital district was randomly selected, out of which three villages were selected randomly. From these villages following the inclusion criteria of (i) all non-pregnant and non-lactating women, (ii) aged 18-45 years, and (iii) willing to participate in the study, a total of 223 subjects were enrolled in the study. The subjects were divided into the experimental group (n=112) and control group (n=111). The experimental groups were further divided into the print media group (n=59) and multimedia group (n=53). Informed written consent was obtained from the subjects.

Data collection

The survey instrument was designed to assess the knowledge component of typical rural hill women in the state of Uttarakhand. The survey instrument was then given to a panel of eight experts to determine face validity, and to examine readability and clarity of wording and instructions.

The survey instrument included a set of 20 multiple choice questions which were

used to test the knowledge of women related to anaemia. Questions were related to cause, prevention, symptoms and control of anaemia. The questions were approved by the panel of eight experts and were pretested on a non sample population.

The knowledge level was divided into three categories viz. low (scores from 0 to 33 %), medium (scores from 34-66 %), and high (scores from 67-100 %) (Upadhyay *et al.*, 2011). Gain in knowledge was computed by deducting pre-exposure score from the post exposure scores.

Media for nutrition education

One of the goals of the study was to develop nutrition education material and a programme that could be easily replicated in other rural communities. Therefore, the intervention was designed to be relatively brief and low cost in terms of time and materials. Pictorial information delivery was an important theory-based element of the intervention, contributing to four components: engagement, comprehension, information retention and behavioral change (Houts *et al.*, 2006a; Houts *et al.*, 2006b). An informative calendar on anaemia depicting etiology, prevention, control, signs and symptoms of anaemia, and a video film in which various aspects of anaemia were explained in a drama form were the media used for nutrition education. Content of calendar and video film was tailored specifically for young and middle-aged women who had grown up in low-resource rural environments. As culturally tailored pictures help make information personally salient, a professional artist was used to create nutrition education materials featuring rural hill families with a positive attitude toward iron rich food consumption. The images in the calendar were also designed to communicate key points with minimal reliance on the written language. Technical language was carefully avoided in the video film. Group discussion was held with the experimental multimedia group to

answer the queries raised by the group on various aspects of anaemia in day-to-day life.

Pre-exposure data collected included knowledge test and haemoglobin estimation by cyanmethaemoglobin method (Dacie & Lewis, 1984).

Calendars were distributed to the print media and multimedia groups for nutrition education. In addition, the multimedia group was exposed to a video film followed by a group discussion. In order to examine the impact of calendar and video film, a post-exposure knowledge test using the same questions as in the pre-exposure stage, and haemoglobin test were repeated after 60 days of exposure.

Statistical analysis

Paired *t*-tests were done to assess the changes in the knowledge scores and hemoglobin level before and after exposure to nutrition education; one-way analysis of variance was applied to gauge the effect of age on gain in knowledge of subjects, and *Z*-test was applied to determine the difference in the knowledge and hemoglobin level of control group, print media group and multimedia groups.

RESULTS

Background information of the subjects

The general information collected included age, educational status, marital status and family income. Height and weight of the respondents were taken to calculate the body mass index. Table 1 presents general information of the respondents. About 38 % of the women were in the age group of 25-35 years. A good proportion of women were found to be literate. Only a small segment (14.34 %) reported that they were either primary school dropouts or had never attended school. Use of print media in any area is dependent on the literacy rate. As literacy rates rises, the print media gains greater importance. However, electronic

Table 1. General information on socio-economic indicators

Variable	Number of Subjects	Percentage
Age (years)		
18-25	63	28.25
25-35	84	37.67
35-45	76	34.08
Educational Level		
No formal education	28	14.34
Primary School	14	7.62
High School	94	46.20
University Degree	62	31.84
Marital Status		
Single	58	26.01
Married	162	72.65
Widowed	3	1.34
Divorced	-	-
Family income		
Less than INR 4, 000	86	38.57
INR 4,000 – INR 7,000	117	52.47
INR 7, 000 – INR10, 000	10	4.48
Above INR 10, 000	10	4.48
Engaged in Farming		
Yes	133	59.64
No	80	40.36
Body Mass Index		
CED II	3	1.35
CED I	28	12.56
Low Weight Normal	42	18.83
Normal	130	58.29
Obese Grade I	20	8.97

media is not dependent on literacy and therefore it can be deduced that understanding of information is affected by educational qualifications.

Marital status data revealed that 72.65 % subjects were married. None of them were divorced. Divorce in India and especially in rural areas is socially unacceptable and therefore divorce prevalence rates are low. The same trend could be seen in the study area.

Women play a leading role in the agricultural sector of Uttarakhand, with their contribution estimated at 80%. (GB Pant University of Agriculture & Technology, 2011). In the present study 59.64 % women

were engaged in farming. A good proportion of the respondents (81.16 %) had kitchen gardens which they used for cultivation of seasonal vegetables and seasonal crops viz. maize and pulses for consumption purposes only. Body Mass Index was calculated by utilising height and weight data collected from respondents. Height was calculated by using an anthropometric rod and weight was calculated by using an electronic weighing balance. BMI data revealed that about 59 % of women fell into the normal category while the rest suffered from various degree of malnutrition, that is, either over nutrition or under nutrition. A variety of functional disabilities such as reduced

working capacity, defective immune response, impairment of learning ability and physical fitness occur in the presence of malnutrition. It has been observed in several studies that in performing the same level of work, malnourished women produce less and take more time (Kaur & Kochar, 2009; Okonoko *et al.*, 2009). Since almost 60 % of the women in the study were engaged in farming, malnutrition incidence may be affecting their work performance and reducing their productivity.

Family income data revealed that 52.47 % of the subjects had a monthly family income in the range of Rs 4000 to 7000. Income of the families ranged between Rs.1250 to 15,000. Family income may affect the number and type of media utilised. As income rises, the spending pattern also rises, therefore it may be deduced that high income families might afford a variety of media.

All respondents at the time of the recruitment were subjected to the nutrition knowledge test. The level of understanding of nutrition knowledge was very low among all the participants. No significant differences were found between the intervention and control group before the intervention. Table 2 shows the mean percent knowledge level and percentage of subjects falling in different knowledge level categories at pre- and post-exposure stages. When classified on the basis of knowledge category, 62.71 % of respondents in the print media group, 67.93 % in the multimedia group and 66.67 % of the control group had low knowledge scores at pre-exposure stage. Only a very small segment of the subjects in all three groups had high knowledge level scores. The remaining subjects were in the medium knowledge category.

A positive change in knowledge scores of print media group subjects, after 60 days of exposure to the nutrition calendar, was noticed. The majority of the subjects (81.36 %) of the print media group, after exposure to nutrition information, progressed to medium knowledge scores (Table 2). It was found that in the multimedia group, after 60

days of exposure to calendar, video film and group discussion, 50.94 % subjects reached the high knowledge category, 45.28 % moved to the medium category and only 3.78 % remained in the low category (Table 2). Mean % gain in knowledge scores were computed by deducting the pre-exposure score from post-exposure score. Effect of age on knowledge score and gain of knowledge was also calculated. This data is presented in Table 3. Mean % score obtained by the subjects at pre-exposure stage were 29.58, 27.83 and 24.78 for print media group, multi media group and control group respectively (Table 3). Mean % scores of print media, multimedia and control group at post exposure stage were 42.37, 64.79 and 22.12 (Table 3).

The results of the hemoglobin test revealed that 69.05 % of the women in the reproductive age group were anaemic with an average haemoglobin value of 10.74 ± 0.86 g/dl. The mean haemoglobin value at pre-exposure stage for the print media group was 10.68 ± 1.95 g/dl with a range of 8.0-14.2 g/dl; for the multimedia group, the value was 10.87 g/dl ± 1.32 with the range being 8.4-14.5 g/dl; and for the control group, the mean haemoglobin value and range were 10.32 ± 1.5 and 7.2-15 g/dl (Table 4). Subsequent to nutrition education, a slight rise in haemoglobin levels of the experimental groups was noticed but it was non-significant (t -value= 0.023 for print media and 0.124 for multimedia group) (Table 4). The control group also did not show any significant change.

A slight but non-significant increase in the number of subjects having normal haemoglobin status was observed in the print media group and multimedia group (Table 5). A reduction in percentage of women in the moderately anaemic group was also noticed. However, in the control group, the percentage of normal haemoglobin status women declined and moderate cases of anaemia increased. When subjected to statistical analysis, no significant change was found.

Table 2. Knowledge levels of hill women at pre- and post- exposure stages of nutrition education (n=223)

Knowledge level categories	Print media group (n=59)			Multimedia group (n=53)			Control group (n=111)					
	Pre-exposure		Post-exposure	Pre-exposure		Post-exposure	Pre-exposure		Post-exposure			
	Respon dents%	Mean % score	Respon dents% Mean %score	Respon dents%	Mean %score	Respon dents%	Mean %score	Respon dents%	Mean %score			
Low	62.71	22.02	15.26	27.78	67.93	18.19	3.78	0	66.67	15.29	73.87	14.82
Medium	30.51	38.68	81.36	46.12	30.18	46.88	45.28	52.6	27.03	35.67	25.23	41.07
High	6.78	75	3.38	82.5	1.89	70.0	50.94	79.29	6.30	78.57	0.90	75

Table 3. Age-wise distribution of knowledge scores

Group	Knowledge scores (maximum scores 100)		Gain in Knowledge
	Pre-exposure	Post-exposure	
Print media group			
18-25 year	36.57	50.52 ^a	13.95
26-35 year	30.23	41.42 ^a	11.19
36-45 year	24.47	41.82 ^a	17.35
Pooled Mean± S.D.	29.58±33.95	42.37±39.89 ^a	12.79
Multimedia group			
18-25 year	37.77	74.44 ^a	36.67
26-35 year	27.61	65.00 ^a	37.39
36-45 year	21.78	53.92 ^a	32.14
Pooled Mean± S.D.	27.83±29.58	64.79±40.63 ^a	36.96
Control group			
18-25 year	26.21	24.67	-1.54
26-35 year	24.21	21.9	-0.29
36-45 year	22.19	18.17	-4.02
Pooled± S.D.	24.78±37.76	22.12±38.84	-2.66

^a significantly different from pre-exposure stage

DISCUSSION

As the literacy rate increases in developing countries, the print medium gains greater importance as a means of informing people and awakening in them a concern to improve their lives.

At pre-exposure stage, a poor knowledge of anaemia was observed in the subjects. After exposure to the nutrition calendar, a significant improvement in the knowledge scores of subjects of the experimental group was noticed. Though the knowledge of subjects increased significantly after exposure to the calendar, the mean scores obtained fell into the medium category, leaving a larger margin for further improvement of knowledge. It may be stated that even though nutrition calendars are helpful for improving the knowledge of women, it did not bring much enthusiasm or stimulation to learn information more critically and carefully. The reason for this could be that the calendar involved a non-interactive mode of communication and did not induce the subjects to read it again and again. Research demonstrates that people are more likely to pay attention to information that is accompanied by explanatory pictures (Levie, 1987). But in the present study, calendars were used in isolation without any information or interaction.

A significant improvement in knowledge scores of subjects exposed to video film was observed. The video film helped the subjects to improve their knowledge and group discussion clarified their doubts. Video film helped the participants 'retain' what they learned from the calendar. Fundamentally, the video film helped to 'engage' participants, and keep their attention focused on the information being presented during the sessions. Research demonstrates that people are more likely to pay attention to information that is accompanied by explanatory pictures (Katz, Kripalani and Weiss, 2006). Studies show that text accompanied by pictures is better

remembered than text alone. This so-called 'pictorial superiority effect' (Houts *et al.*, 2006a) is especially strong when people see pictures with an oral explanation and later see the same pictures to remind them of what they heard (Houts *et al.*, 2006). This was particularly true for subjects in the multimedia group.

Knowledge scores when computed on age group basis showed that age has significant bearing on nutritional knowledge. The younger age group (18-25 years) scored more than the older age group at pre-exposure stage. A tendency towards lower scores on nutritional knowledge with increasing age group was observed ($F=3.90$, $P<0.05$).

After exposure to the nutrition calendar, all age group showed significant improvement in the knowledge scores and highest scores were again obtained by subjects of 18-25 years. When gain in knowledge was computed, women aged 36-45 years scored the lowest. Women aged 26-35 years emerged as most receptive to knowledge by showing the highest gain in knowledge. Although knowledge scores after exposure to the calendar were highest for subjects of age group 18-25 years, their mean gain was less than that of women aged 26-35 years. It may be because they do not give importance to content and go more for entertainment. No significant trend in age group and gain in knowledge was observed in the print and multimedia group (F value 7.39, $P<0.05$).

After nutrition education, a consistent but non-significant increase in number of subjects having normal haemoglobin status was observed in the print and multimedia group. However, the control group showed a decline in haemoglobin values in the normal and mild anaemic group. The mean haemoglobin concentration of the subjects in the print and multimedia group also increased though it was not significant. Although the change in haemoglobin status was not significant, a slight improvement in

the mean haemoglobin concentration of subjects was noticed. To determine the direction of change more critically, haemoglobin levels of subjects at pre- and post-exposure stages were compared and the number of subjects showing increased, decreased or stable haemoglobin was recorded. It was found that 39.58% of the subjects from the print media group and 36.32% of subjects from the multimedia group showed increased haemoglobin status; in the control group, only 2.9% of subjects showed increased haemoglobin status. A decreased haemoglobin status was found in 3.38% of the subjects in the print media group, 5.67% in the multimedia group and 11.71% of the subjects in the control group; the remaining subjects maintained their haemoglobin status. On comparing the print media group and the multimedia group to the control group, it was found that a high percentage of subjects from the experimental group showed increased haemoglobin levels over the control group. It indicates that nutrition education helped the subjects to improve their haemoglobin status, though the increase was not significant. Since the nutrition education programme was of short duration (two months), the changes were not significant as diet changes will take a longer time to be reflected in higher haemoglobin levels. Sachdeva, Sukhwinder and Sangha (1996) and Chawla, Kaur and Sachdeva (2004) in their nutrition counselling studies in different parts of India similarly reported lower hemoglobin levels in about 50% of the subjects subsequent to nutrition education. The results of the study found that nutrition education through calendar and video film and group discussion was effective in bringing about a positive change in knowledge, and this has been found in many other studies also (Ritchie *et al.*, 2010; Shankar *et al.*, 2007). However, nutrition and health care knowledge did not lead to parallel dietary and health behaviour changes. Several factors may explain this apparent incongruence; short duration of the

programme could be one of the reasons. Liu *et al.* (2009) also reported in their study that nutrition and health care knowledge and attitudes may not always lead to actual changes in behaviours.

CONCLUSION

This study developed nutrition education material on anaemia, suitable for use among rural women, amidst demands on their time. Mass media programmes of longer duration and involving more than one media type should be encouraged by the government as a long term approach to combat the problems of nutritional disorders in rural illiterate communities. The television, magazines and Internet could be made use of to reach the women and their families. However, face-to-face contact of health professionals and the health education guidebooks are still recommended as additional effective communication channels, as these were welcomed by most of the women in the study.

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