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Research Article

Evaluation of an Educational Intervention based on Health Belief Model in Promoting New Born Screening Behavior of Mothers for Early Detection of Children with Congenital Hypothyroidism

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Abstract

Congenital hypothyroidism causes permanant damage and lifelong complications such as mental retardation and development delays in children if not detected and treated early. This study is aimed at determining the effect of a health education program based on the Health Belief Model (HBM) on mother's participation in newborn screening (NBS) for congenital hypothyroidism (CH) program. A group of public health midwives (PHMs) in a medical officer of health (MOH) area in Southern province were educated about NBS for CH and instructed them to educate mothers in their respective working areas on NBS for CH. Three months after the educational intervention 3 groups of mothers, 100 in each; one from the MOH areas (4, taken as interventions) where the intervention was carried out and two from other MOH areas (6, taken as controls) were assessed regarding their knowledge, attitudes and skills on NBS for CH using an interviewer administrated questionnaire. The questionnaire included statements to assess the constructs on perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action described in the HBM model. The questionnaire was evaluated by an expert panel, and necessary modifications were made. Data were analyzed using descriptive statistics and analysis of variance (ANOVA). Mean scores of the constructs on perceived benefits and cues to action were higher in the intervention group compared to control groups ($p < .05$), but no such differences were found in the constructs of perceived susceptibility, perceived severity and perceived barriers. Therefore, the educational program based on HBM model seems to be effective in changing certain aspects of NBS behavior of mothers. Further modifications in the program, especially related to perceived susceptibility and perceived severity of CH and of the barriers to participate in NBS for CH are needed.

Introduction

Congenital Hypothyroidism (CH) is one of the most common endocrine diseases found in neonates causing mental retardation and developmental delays in children [1,2]. Prevalence of the disease varies from 1: 600 to 1: 2000 in different population groups. High prevalence was reported in iodine deficient areas, as well as in poor and middle income countries [3]. Thyroid agenesis and interference in thyroid hormone biosynthesis are the common causative factors of CH [4]. Most neonates with CH do not show clinical features of the disease such as jaundice, feeding issues, hypotonia, protuberant tongue and umbilical hernia at birth because many have some residual thyroid function, and also because

of the temporary protection offered by partial transplacental passage of maternal thyroid hormone [5]. Therefore, clinical diagnosis usually gets delayed until 3 months of age or older. This may cause irreversible brain damage as a result of inadequate thyroid hormone supply to the body. If the newborns with CH are treated promptly with replacement of levothyroxine, there is a greater chance for them to get recovery from the adverse consequences associated with CH [6]. New born screening (NBS), a primary preventive activity, is the universally accepted method in identifying new cases at an early stage [7]. NBS for CH would therefore, assist mothers and health care professionals to take necessary actions promptly if the child is found to be CH positive [7].

CH has been identified as a significant child health issue in Sri Lanka and it is revealed that the prevalence was 1:1500 [8]. In the year 2010 the first formal NBS programme was implemented in Southern province in Sri Lanka with support from many government institutions. Pre- screening education for parents on NBS is an integral part of this new NBS program. However, designing a health education programme on NBS for CH for stakeholders is always a big challenge because such a program should be powerful enough to change the NBS behavior of antenatal mothers. In Sri Lanka public health midwives (PHMs) are the grass root level health professionals who are responsible for improving maternal and child health. Thus, in motivating mothers to get the test done, the role of the PHMs is vital.

Behavioural theorists have explained different theories which can be used to explain or predict health behavior of people and evaluate health education programs on different levels [9]. Health Belief Model (HBM) is considered as a widely used theory for identifying health utilization behavior of people and assessing population perceptions towards an ongoing health programme, and as a foundation for health educational interventions [10,11]. This model consists of six constructs; perceived susceptibility, perceived seriousness, perceived barriers, perceived benefits, cues to take actions and self-efficacy [11,12]. According to the HBM, people are more likely to take health actions if they feel that they are susceptible to a serious disease that can be prevented if proper actions are taken in timely manner. If the benefits of the health actions overweigh the possible barriers to take the actions, and if there are any encouraging cues to take actions then the probability of taking such health actions by the target group would increase. This paper describes the effectiveness of a health education programme designed based on the HBM to motivate antenatal mothers in participating NBS for CH.

Material and Methods

A Quasi experimental study was conducted selecting one intervention and two control groups. Four MOH areas from Galle district were selected for the intervention group while 3 MOH areas from each of Galle and Matara districts were included in the control group. As the first step of the study all the PHMs working in Galle intervention areas were educated on NBS and its associated factors. They were instructed to conduct sessions on education targeting antenatal mothers during the last trimester. In these sessions information on seriousness of the disease, its severity, benefits that they receive, how to overcome barriers in doing the test were imparted and finally reminding the mothers to give a blood sample for the screening test before leaving the hospital after delivery. PHMs were provided leaflets, posters and booklets for their use during the educational program and also to be distributed to antenatal mothers.

PHMs in control group selected from both Galle and Matara districts were not educated on above areas. Three months after the educational sessions for the intervention group, 100 postnatal mothers from each of the intervention and two control groups were randomly selected to make a total of 300 in the sample. All the subjects were given researcher administered questionnaire that consisted statements based on HBM using Likert scale type questions.

The questionnaire consisted of statements related to NBS for CH based on the constructs of HBM, and several other questions on knowledge, attitudes and skills related to iodine difficiency and NBS for CH. Five constructs of the HBM model were assessed on the statements using a 5 point likert scale; *strongly agree* to *strongly disagree*. The assessment tool included 2 statements to assess perceived susceptibility, 7 statements to assess perceived seriousness, 5 statements to assess perceived benefits, 5 statements to assess perceived barriers and 6 statements to assess profile of cues to take actions. For the 2 questions used to assess the perceived susceptibility, 5 marks were given to the answer *"Strongly agree"* and 3 marks to the answer *" agree"* and zero marks to all other answers given for any of the statements. A total score was then given to each participant by summing up participants' responses given for the two questions (range 0 – 10). Higher scores reflected higher perceived susceptibility. Perceived severity (range 0- 20), perceived benefits (range 0- 20), perceived barriers (range 0- 35) and cues to actions (0- 30) were measured and scored in the same way.

Statistical Package for Social Sciences (SPSS) was used to analyze the data [SPSS Inc, Chicago, USA]. Post test data on study and control groups were considered separately. Mean scores and standard deviations (SD) of the constructs of perceived susceptibility, perceived severity, perceived benefits, perceived barriers and cues to take action were calculated. Groups were compared using ANOVA. Statistical significance was determined at $p<0.05$.

Results

A total of 300 postnatal mothers of 18 - 44 years of age were included in the analysis. No significant age differences were found between the intervention and the two control groups in mean age (*SD*); of being 29 (5.34), 29 (4.74) and 30 (5.31) years respetively. Basic demographic data of the subjects are given in Table 1. Using the answers to the questions on knowledge on CH, a composite score was calculated that ranges from 0 to 70. In the intervention and in two control groups the mean values were 19.3 (SD = 3.2), 19.6 (SD = 5.3) and 19.4 (SD = 3.6) respectively, indicating an over all poor knowledge on CH in all three groups.

Table 1. Basic characteristics of the study subjects[1].

Character		Intervention	Control	
		Galle	Galle	Matara
Age	<20yrs	30	36	32
	<30 yrs	54	51	50
	>30 yrs	16	13	18
Income (SLR)	<10,000.00	8	14	18
	10'- 20,000.00	33	34	25
	>20,000.00	59	52	57
Education	Up to Grade 5	7	12	6
	Up to O/L	48	49	42
	Up to A/L	29	30	32
	Graduate	13	8	18
No of babies	1	52	50	51
	2	30	33	24
	3	11	9	15
	4 or more	7	8	10

[1]There were 100 mothers in each group. Results presented as number of mothers in each category.

Mean Scores, SDs and 95% confidence intervals were calculated on all 5 HBM constructs that were investigated in this study. ANOVA was used to check mean differences between groups in each of the constructs we studied (Table 2). Post-hoc comparisons were also made and significantly higher mean scores for the construct on 'perceived benefits' were obtained for Galle intervention (mean = 8.08(3.7) and Galle control (mean = 7.54(2.32) compared to Matara control (Mean = 5.6(4.19) ($p< 0.05$). Further, a significantly higher mean score for the construct on 'cues to action' was obtained for Galle Intervention (Mean = 2.81(4.76)) compared to Galle control (Mean =1.55(2.4) $p<.05$) and Marata control (Mean = 1.39(2.73), $p < 0.05$. There were no significant differences in the constructs on perceived susceptibility, perceived severity and perceived barriers in the three groups.

Table 2. Mean, standard deviations and 95% CI of the HBM constructs by group.

Group	Perceived Susceptibility	Perceived Severity	Perceived Benefits	Perceived Barriers	Cues to action
Galle Study	0.11(0.85)	0.76(1.94)	8.08(3.7)	1.08(1.85)	2.81(4.76)
	0.05-0.27	0.37-1.14	7.3-8.8	0.71-1.44	1.86-3.75
Galle Control	0.03(0.3)	0.43(1.29)	7.54(2.32)	0.78(1.63)	1.55(2.4)
	0.02-0.08	0.17-0.68	7.07- 8.0	0.45-1.10	1.06-2.03
MataraControl	0.00(0.00)	0.45(1.3)	5.6(4.19)	0.79(1.94)	1.39(2.73)
	0.00-0.00	0.19-0.71	4.8-6.5	0.40-1.17	0.84-1.93
P value	0.306	0.241	<0.001	0.415	0.007

Discussion

Theory based health education interventions would yield better outcomes, and would guide researchers and policy makers to develop cost effective and result oriented health programs [12,13]. Health belief model has been widely used in many public health interventions and it is one of the most popular models used in screening programs [13]. HBM provides a foundation to understand target populations knowledge and attitudes and what education strategies would be useful in motivating people to change their behaviors [14,15,16,17]. In this study, 5 constructs in HBM were used to evaluate a health education intervention aimed at increasing postnatal mothers' knowledge on NBS and CH, and motivation of mothers to use NBS to identify newborn babies who are at risk of developing CH. Thus, it would serve as a practical tool to develop effective health education strategies.

Knowledge on CH was poor in this target population. The findings of the study indicated that there were significant differences between the mean scores on perceived benefits in the intervention group and Matara control groups where none of the PHMs in the district had been given any education on NBS for CH. A significant difference was also seen between the Galle control and Matara control groups. However, there was no such difference observed between intervention and Galle control groups. The mothers in the intervention area appered to have a better perception of the health benefits of NBS for CH and this is most probably be due to the health education intervention done on PHMs on CH. Probably due to contamination, mothers in the other MOH areas in the district where the intervention was conducted, may have learnt health benefits of the behavior compared to the control subjects in the other MOH areas. Studies have shown that mean scores of perceived benefits were increased by health education [18,19]. Therefore it seems that PHMs were able to dessiminate effectively the benefits of the behavior among mothers.

Mean scores of the construct on "cues to action" was significantly higher in the intervention group compared to the control groups. Cues to action are simulators that would reinforce mothers to change or modify their health promoting behaviors. Cues such as leaflets and handouts may have reminded them the importance of NBS behavior in protecting their children from being vulnerable to CH and thus may have contributed to promote NBS behavior of mothers. Therefore these educational materials could probably be used in the future to motivate all mothers to get the screening test done as it is a cost-effective, acceptable and easy to use method in this cultural context.

Susceptibility to and the severity of the CH were not seemed to be well perceived by the mothers. PHMs may have used technical terms in educating mothers about the seriousness of the disease and how to evaluate the chances that a child would get the CH. Effective ways of delivering these information as well as strategies to overcome possible barriers in practicing NBS behavior need to be further investigated.

Post test only design that was used in the study is not the best research design to evaluate the effectiveness of an educational intervention. Ideally a pre evaluation should have been done to check the real effect of any intervention. As observed in a study conducted in Iran, our mothers also exhibit an overall unsatisfactory knowledge on NBS for hypothyroidism [20]. One possible cause for this observation is that NBS for CH is relatively a new health screening program in the Sri Lankan context. Thus, health authorities should use other avenues such as mass-media to increase public awareness about NBS for CH.

In summary, **t**hese findings indicated that the health education intervention conducted to motivate mothers by participating in NBS for CH based on the HBM model seems to be effective in changing NBS behavior of the mothers. The findings also support the feasibility of conducting health education interventions on NBS using PHMs. However, HBM may not have been the most appropriate theoretical model for use on this population since knowledge on CH among mothers appered low. Nevertheless, the existing program should be further developed based on the results of the study and educational interventions should target areas such as seriousness of the disease for education of mothers. Formative evaluations of such programs are needed to inform the authorities about the strengths and weaknesses of the programs and to take timely actions to remedy the problems.

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