

Investigating the Effect of an Educational Intervention on Health Promotion Behaviors, Hope Enhancement and Mental Health in Cancer Patients

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Abstract

Background: The aim of this study is investigating the effect of educational intervention based on PRECEDE model on health promotion behaviors, hope enhancement and mental health of cancer patients in Shiraz, Iran in 2017–2018

Methods: In this quasi-experimental study, 200 cancer patients (100 subject in experimental group and 100 subjects in control group) referred to Amir Hospital in Shiraz were investigated. Educational intervention for experimental group consisted of twelve educational sessions for 50-55 minutes. A questionnaire including demographic information, PRECEDE constructs (knowledge, attitude, self-efficacy, enabling factors and social support), was used to measure health promotion behaviors, patients' hope and mental health before and 6 months after intervention.

Results: Data were analyzed by SPSS 22, paired t-test, independent t-test and Chi-square test at the significance level of $p < 0.05$. The average age of cancer patients of experimental group was 46.82 ± 5.96 years and 46.12 ± 5.48 years in control group. 6 months after intervention, experimental group showed significant increase in knowledge, attitude, self-efficacy, enabling factors, social supports, health promotion behaviors, patients' hope and mental health compared to the control group.

Conclusions: This study showed the effectiveness of intervention based on PRECEDE constructs in mentioned factors 6 months after intervention. Hence, this model can act as a framework for designing and implementing educational intervention for health promotion behaviors of cancer patients.

Background

In fact, cancer is not a disease with an especial reason, it is a group of diseases with various symptoms, treatments and prognoses [1]. Facing with cancer is a stressful event that makes some difficulties in patient's health including physical, mental and familial health. Cancer patients have high level of mental and emotional disorders including disappointment, stress, lack of self-confidence, fear and death [2, 3]. Among these problems, stress, disappointment and frustration are highly prevalent among cancer patients [4]. Also, due to the uncertainty about future, individual communications become disturbed, the previous adaptation mechanisms become insufficient and continuous hospitalizations make the patient feel alone. These problems and related psychological issues disable them to deal with new situation and cause a lot of difficulties [5–9]. Studies showed that, health promotion behaviors improve life quality of patients and healthy behaviors and lifestyles are the most important factors for preventing disease [10], hence, they are considered as the main facilitators for improving and promoting patients' health [11]. According to the researches, unhealthier behaviors and lifestyles such as inappropriate nutrition, smoking, alcohol consumption and drug abuse make the recovery period longer, however, healthier lifestyle is a positive factor in treatment [12 and 13]. Hence, health promotion behaviors and lifestyles enhance the life quality of patients [14] and patients with healthier lifestyle will be able to save their health and perform daily activities more efficiently [15]. Researchers reported the health promotion

lifestyles as an important factor for preventing cancer [10] and patients' adaptation with disease [16]. A group of Italian researchers found that, the most important factor for having insufficient life quality is having health-degrading behaviors and conditions such as stress, frustration, unemployment, age older than 10 years and low educational levels [17 and 18]. Hope has a great influence on patients' adaptation with difficult conditions especially when there are pain and privation [19]. Investigations indicated that, psychological problem among cancer patients is a major problem that most of the patients have experienced [20] and the significant role of mental health as a fundamental aspect for having healthy lifestyle becomes considerable [21]. Additionally, due to the fatal nature of cancer, its diagnosis causes significant enhancement in spiritual needs of patients, reduction of self-confidence and individual communications. Also, hospitalization makes the patient to feel alone [22]. When mental health is seriously endangered, patient may suffer from psychological disorders such as loneliness, disappointment and lack of meaning in life [23]. Mental health is one of the four aspects of human health (physical, psychological and social health) and causes the promotion of general health, adaptation ability and mental performance of patient. Mental health is determined by some other characteristics such as stability, peace, having closer relationship with oneself, God, society and environment, aim and meaning of life and etc. [24]. Numerous studies have revealed that, one of the important results of dealing with cancer in cancer patients is their return to spirituality [27]. Mc Cleath et al. [28] concluded that, mental health has a great effect on frustration of patients. Also, Conig et al. [29] revealed that, in stressful conditions, especially health problems, spirituality is the main source of calmness and compatibility. Patients with improved mental health can be efficiently compatible with cancer and even they can efficiently pass the final stages of disease [27]. The study of Snyder et al. [30] on physical and psychological patients indicated that, most of diseases are due to the lack of hope and hope treatment can improve the general health and life quality of patients. Abdi et al. [31] showed that, psychological interventions in hope treatment cause the promotion of life expectancy in cancer patients. Snyder et al. [32] showed that, hope treatment intervention enhances the general health and reduces the symptoms of psychiatric pathology. Mehmet and Rozin [33] found that, patients who are constantly hopeful have less frustration symptoms. Taylor and Brown [34] confirmed the effectiveness of hopeful thoughts and positive beliefs on general health. A study performed on cancer patients showed that, the accelerating psychological factors including stress, fear, anger and frustration can be reduced by psychological treatments [36].

Due to the chronicle and threatening nature of cancer and related problems, providing educational programs and interventions for promoting healthy behaviors in patients becomes more demanded [37, 38 and 39]. An effective health education and promotion program needs professional analysis in related problems [40]. Health promotion is related to all effective factors including health services, genetic factors, individual behaviors and physical, economic and social issues. Theories and patterns in health education and promotion present a systematic perspective for analyzing the successes or fails of educational interventions [41]. One of these patterns for changing behavior and investigating the possible conclusions of an educational program is precede model [41] which was presented by Larence Green and Marshal Croter. It is an approach for planning and analyzing the effective factors for changing behaviors

and declares that, constant changes are always voluntary and this issue can be determined through individual motivations for engaging in changing process [43]. Oliver et al. [44] investigated a pattern for prostate cancer screening among American rural men aging from 40 – 52 years by using health belief model and indicated significant statistical differences in health belief model constructs, knowledge and age of men participated in prostate cancer screening compared to those who did not participate. Among health belief model constructs and other demographic variables, only subjects' attitude had significant relationship with subjects' participation in prostate cancer screening. Mitchel et al. [38] used precede model for evaluating the performance of cervical cancer screening and concluded that, pregnancy prevention, cues to action and positive attitude had significant relationship with Pap smear test performance. Khani Jeihooni et al. [45] investigated the effect of educational intervention on the performance of prostate cancer screening by using precede model and concluded that, 6 months after educational intervention, the average scores of knowledge, attitude, self-efficacy, enabling factors, social supports, life quality, general health and screening behaviors were significantly enhanced.

According to the importance of health promotion behaviors, hope and mental health of cancer patients, the purpose of present research is investigating the effect of educational intervention based on precede model on health promotion behaviors, the enhancement of hope and mental health of cancer patients.

Methods

Present research is a quasi-experimental and interventional study performed on 200 cancer patients who referred to Amir Hospital in Shiraz. They were selected randomly for experimental and control groups (100 subjects for each group). The inclusion criteria were being aware of cancer diagnosis, being in non-metastatic stage of cancer from diagnosis to two years later, having at least 18 years of age and being able to participate in this study. The exclusion criteria were not participating in any educational sessions except the educational sessions of this study and not being infected by psychological disorders and colorectal cancer.

After determining the sample volume and subjects' characteristics, a consent letter was filled out by subjects about their participation. A questionnaire was used for gathering demographic information such as age, job, marital status, educational level, economic situation, type and duration of cancer and family history in cancer. A questionnaire was used for evaluating patients's hope based on Herth hope index including 12 items in four-point Likert scale from "completely disagree" with the score of 1 to "completely agree" with the score of 4. The consistency of this questionnaire was validated based on the studies of Benzein and Berj [64] and Herth et al. [47]. For evaluating the content validity of questionnaire, panel specialists was used and for determining tool consistency, Cronbach's alpha for Herth hope index was employed ($\alpha = 0.72$). The total scores of Herth hope index were between 12 to 48.

Also, Palotezin and Elison questionnaire was used for evaluating the mental health. This questionnaire included 20 items, 10 items for religious health and 10 items for the existential health ranging from 20–

120 scores in six-point Likert scale from “completely disagree” with the score of 1 to “completely agree” with the score of 6.

A multi-dimensional questionnaire about health promotion lifestyles presented by Polerecky et al. [49] was also used for measuring health promotion behaviors of subjects including 52 items about 6 aspects of health promotion behaviors such as nutrition, physical activity, mental health, health responsibility, stress management and interpersonal relationships in four-point Likert scale as “never” (1), “sometimes” (2), “usually” (3) and “always” (4). The consistency of this questionnaire was reported based on Cronbach’s alpha ranging from 0.79 to 0.94 [50]. The minimum score was 52 and the maximum score was 208.

A questionnaire based on precede pattern was provided based on the similar studies [51–53]. 20 items were used for investigating knowledge of subjects. Correct answer had the score of 1 and the incorrect answer had zero score ranging from 0 to 20 scores. Also, 20 items were asked about the attitude in five-point Likert scale from “completely disagree” with the score of 1 to “completely agree” with the score of 5 (ranging from 20 to 100 scores). Also, 20 items evaluated the self-efficacy in five-point Likert scale from “completely disagree” with the score of 1 to “completely agree” with the score of 5. In this section, the minimum score was 20 and the maximum score was 100. The perceived social support included 15 questions evaluating the total perceived social supports from family, friends, doctors and health center officials in five-point Likert scale from “completely disagree” with the score of 1 to “completely agree” with the score of 5 ranging from 15 to 75 scores. 10 items were about the enabling factors in five-point Likert scale from “never” with the score of 0 to “always” with the score of 4 ranging from 0 to 40 scores.

The content validity was evaluated through the impact index item higher than 0.15 and content validity ratio higher than 0.79. For determining the face validity of tools, a list of arranged items was considered by 30 cancer patients with similar demographic, economic and social characteristics with studied subjects. For determining content validity, ideas of 12 specialists (out of research team) in health education and promotion (n = 10) and oncologists (n = 2) were used. Based on Lawshe's table, items with CVR value higher than 0.56 for 12 people were considered acceptable and retained for subsequent analysis. Also, in current research, the calculated values for most of the items were higher than 0.70.

According to the calculated Cronbach’s alpha, total consistency of research tools was 0.87. The consistency of knowledge was 0.84, attitude was 0.86, self-efficacy was 0.81, social support was 0.80 and self-efficacy was 0.83. Questionnaires were filled out before and 6 months after educational intervention by experimental and control groups.

According to the obtained results in pre-test stage and the ideas of specialists, educational intervention was performed for experimental group in 12 sessions for 50–55 minutes by giving presentations, asking and answering questions, presenting educational films and group discussions. Educational intervention about nutrition included the importance of nutrition, side effects of cancer treatments (chemotherapy, radiotherapy and etc.) and how to deal with these side effects, useful foods during treatment, teaching

Loading [MathJax]/jax/output/CommonHTML/jax.js for saving nutrients and emphasizing on the importance of

fruits and vegetables for restoring the lost cells. Also, the importance of physical activities for removing or reducing tiredness, improving sleep quality and mental conditions were discussed. Intervention for increasing patients' hope was also performed for experimental group and some supportive points for their families and friends were mentioned and one educational session was also held with the presence of related doctors.

educational intervention for promoting mental health and patients' hope included meaning therapy about the meaning of suffer, life, death, pray, having direct relationship with God and the corresponding effects of body and soul on each other was also performed face to face for experimental group. It should be noted that, control group received no educational intervention. For following patients' activities, a follow-up session was held for cancer patients once a month and a Whatsapp group was provided for exchanging information and educational booklet and pamphlet were given to subjects. Obtained data were analyzed by Spss 22 software, paired t-test, independent t-test and Chi-square in significance level of $P < 0.05$.

Results

In this study, the average age of experimental group was 46.82 ± 5.96 years and 46.5 ± 12.48 years in control group. Based on independent t-test, there observed no significant differences in two groups ($p=0.134$). Chi-square test indicated that, there was no significant statistical differences between two groups in employment status ($p=0.521$), monthly household income ($p = 0.234$), educational level ($p = 0.155$), marital status ($p = 0.128$), cancer duration ($p = 0.284$) and sex ($p = 0.164$) (Table 1). In current study, 53 subjects had skin cancer (26.5%), 46 subjects had Leukemia (23%), 16 subjects had bone cancer (8%), 12 subjects had cervical cancer (6%), 28 subjects had breast cancer (14%), 18 subjects had lung cancer (9%), 15 subjects had gastric cancer (7.5%) and 8 subjects had prostate cancer (4%). Results revealed that, before educational intervention, there was no significant differences in experimental and control groups in knowledge, attitude, self-efficacy, social supports and enabling factors. However, 6 months after intervention, experimental group had significant enhancement in each of the mentioned variables, while, there seemed no significant differences in control group (Table 2).

Table 1
The comparison of demographic variables of experimental and control groups

variables	Experimental group N=100		Control group N=100		P-value	
	number	percent	number	percent		
Employment status	employed	32	32	30	30	0.521
	unemployed	68	68	70	70	
	Monthly household income	Less than 10 million Rials	20	20	18	
	10 to 20 million Rials	45	45	46	46	
	More than 20 million Rials	35	35	36	36	
Educational level	Illiterate	3	3	2	2	0.155
	Elementary	15	15	18	18	
	Guidance school	32	32	30	30	
	High school	36	36	35	35	
	university	14	14	15	15	
Marital status	single	8	8	4	4	0.428
	married	92	92	96	96	
Duration of current disease	Less than 5 years	42	42	40	40	0.284
	5 years and more	58	58	60	60	
sex	female	61	61	58	58	0.164
	male	39	39	42	42	

Table 2

The comparison of average scores of precede pattern constructs in experimental and control groups before and 6 months after educational intervention

variables	group	before intervention	6 months after intervention	P-value
		M SD	M SD	
knowledge	experimental	9.3 14.28	16.3 84.12	0.001
	control	10.3 8.19	11.3 16.25	0.318
	P-value	0.260	0.001	
attitude	experimental	40.10 34.35	75.10 22.14	0.001
	control	42.10 15.27	44.10 36.08	0.174
	P-value	0.347	0.001	
Self-efficacy	experimental	37.9 24.80	70.9 11.43	0.001
	control	38.9 12.21	40.9 17.52	0.145
	P-value	0.182	0.001	
Social supports	experimental	30.8 18.42	60.8 23.20	0.001
	control	31.8 50.24	33.8 18.12	0.254
	P-value	0.280	0.001	0.001
Enabling factors	experimental	12.3 55.53	31.3 22.66	0.001
	control	12.3 14.61	13.3 95.84	0.212
	P-value	0.128	0.001	

Obtained results revealed that, before intervention, there was no significant differences in two groups in health promotion behaviors, hope and mental health, however, 6 months after intervention, experimental group had significant enhancement in mentioned factors, while there seemed no changes in control group (Table 3).

Table 3

The comparison of average scores of health promotion behaviors, hope and mental health in experimental and control groups before and 6 months after educational intervention

variables	group	before intervention	6 months after intervention	P- value
		M SD	M SD	
Health promotion behaviors	experimental	97.18 25.34	17.18 25.10	0.001
	control	102.18 18.52	107.18 22.40	0.104
	P-value	0.192	0.001	
hopefulness	experimental	20.4 35.14	39.4 24.11	0.001
	control	21.4 27.50	22.4 39.53	0.215
	P-value	0.362	0.001	
Metal health	experimental	43.8 54.36	91.8 74.56	0.001
	control	44.8 73.28	46.8 33.19	0.198
	P-value	0.274	0.001	

Discussion

Health promotion behavior is one of the important factors in mental and physical consequences of cancer patients. The chronic and threatening nature of cancer causes mental crisis and disappointment in patients. Mental health promotion and hope enhancement are significant factors for decreasing stress caused by cancer and passing treatment days. The results of this research indicate that, using precede model leads to the enhancement of average score of precede pattern constructs, the promotion of mental health, the increase of hope and the improvement of health promotion behaviors.

Obtained results indicated that, 6 months after educational intervention, the average score of knowledge in experimental group had significant enhancement, while there seemed no changes in control group. Holding educational sessions, presenting educational contents in group discussions and asking and answering questions and giving educational booklet caused the enhancement of knowledge of experimental group. Results of Khashfi et al. [54], McCree-hale et al. [55], Didarlou et al. [56] and Khani Jeehooni et al. [57, 58] revealed that, educational intervention caused the enhancement of knowledge of studied subjects.

Results of this research showed that, before educational intervention, the average score of experimental and control groups attitude was very low, however, 6 months after intervention, significant enhancement was observed in experimental group, while control group had no changes. In precede pattern, the

predisposing factors such as knowledge and attitude are very important for changing behavior [59]. In present research, the increase of knowledge and positive attitude caused the facilitation of health promotion behaviors, enhancement of hope and mental health of cancer patients. Also,, presenting educational contents through practical shows, asking and answering questions and providing a Whatsapp group for exchanging information and experiences caused the enhancement of attitude in experimental group. The results of other studies are in a good agreement with the results of present research [54, 60, 61 and 62].

Results of this research indicated significant enhancement in average score of self-efficacy 6 months after intervention in experimental group, while control group had no changes. When cancer patients have high control on their disease, they have rational behaviors for promoting their health. Self-efficacy indirectly influences the attitude through perceived barriers and stability for continuing a special activity [63]. In study of Khani Jeihooni et al. [64], educational intervention based on precede model caused the enhancement of average score of self-efficacy 6 months after intervention in experimental group, while control group had no changes. In another study performed by Khani Jeihooni et al. [65], for promoting the prevention behaviors from skin cancer, he used precede pattern and figured out that, 4 months after the intervention, the average score of self-efficacy of experimental group increased. In study of Zare et al. [66], educational intervention caused the enhancement of average score of self-efficacy in men for doing prostate cancer screening. In studies of Khiyali et al. [67], Malmir et al. [68] and Yates et al. [69], educational intervention caused the enhancement of average score of self-efficacy in studied subjects. Najafi et al. [70] investigated the factors related to prevention behaviors from skin cancer in high school students and revealed that, there is a significant and positive relationship between prevention behaviors, attitude, self-efficacy, social supports and enabling factors.

In current study, before educational intervention, the average score of perceived social supports was very low, however, 6 months after the intervention, a significant enhancement was observed in experimental group. By increasing social supports, health promotion behaviors of patients improve. Holding educational sessions, creating helper and friends groups, continuous contact with patients and following their activities caused the increase of average score of perceived social supports in experimental group. Mathews et al. [72] investigated efficient factors for searching medical information in cancer patients including knowledge, social supports, religious beliefs, insurance, anxiety, fear and etc. In study of Satia et al. [73], doctors' recommendations and family supports were effective factors for having positive behavior in prostate cancer patients. Dugglebg et al. [74] investigated the efficiency of mental and social supports in the enhancement of life quality in cancer patients. He also studied the effect of Live with Hope Program (LWHP) on the enhancement of hope and life quality of cancer patients. In his research, experimental group whom received LWHP had higher score in hope enhancement. In study of Taghdisi et al. [62], by using BASNEF model, there seemed no significant differences in average score of social supports (subjective norms) and enabling factors in both of the experimental and control groups after educational intervention. In studies of Khani Jeihooni [75, 76], Kashfi et al. [54] and Hazavehei et al. [76], educational intervention caused the enhancement of average score of subjective norms (social supports)

Matin et al. [77] studied the effective factors on life quality of addicted men by using precede pattern. He revealed that, the studied variables determine 17% variance in life quality and the social support plays an important role in life quality of people. Chambers et al. [78] investigated 140 cancer patients in Australia and showed the reduction of stress and disappointment and the improvement of life quality and correct judgment about disease.

In this study, before the educational intervention, the average score of enabling factors of subjects was low. However, 6 months after intervention, experimental group had significant enhancement. Providing educational booklet for cancer patients, availability of doctors, providing Whatsapp group, following subjects' activities after educational sessions, holding an educational session for one of the family members and presenting motivational contents caused the increase of patients' ability to perform health promotion behaviors and the enhancement of hope and mental health. Castellanos et al. [79] investigated the effect of diet on post-migrant Hispanic men by using precede-proceed model and grounded theory. He indicated that, educational interventions should be based on enabling, predisposing and improving factors. Cannick et al. [80] carried out a study about the prevention and early diagnosis of oral cancer by using precede-proceed model for educating dentistry students. In his study, the educational intervention caused the enhancement of enabling factors and other constructs of this model. The results of other similar studies are in a good agreement with the results of this investigation [54, 57, 81 and 82].

According to the importance of hope in cancer patients, for retaining and promoting hope of experimental group, educational intervention was performed by presenting motivational contents, ways of being happy and positive structures. In this research, participants were active in different discussions and presented their opinions and were responsible for solving their problems. Herth et al. [47] studied the enhancement of hope in primary stages of cancer and observed significant differences between hope and life quality in experimental and control groups and after educational intervention, the average score of hope in experimental group enhanced, while control group had no changes. In study of Taghdisi et al. [62], educational intervention caused the enhancement of hope in cancer patients and their families. Movahedi et al. [83] investigated the effect of hope treatment education on life expectancy and general health of cancer patients. His results revealed that, hope treatment caused the promotion of life expectancy and general health of experimental group. The role of psychological intervention in managing stress and other mental symptoms of cancer patients is significant because, after psychological interventions, the level of stress and disappointment of cancer patients reduced significantly and the interpersonal relationship of patients improved [35]. The studies of Taylor and Brown [32] and Mehmet and Synder [34] indicated that, hope treatment was effective on the improvement of general health of cancer patients. In study of Kamian et al. [84] on 100 women suffering from breast cancer, it was revealed that, educational intervention caused the enhancement of average score of hope and mental health of experimental group. Also, there was a significant relationship between mental health and hope. Felder et al. [85] investigated hope and adaptation of patients with cancer and indicated a significant and positive relationship between hope and adaptation skills. He also observed that, patients with higher level of hope have more adaptation skills. Rusteen et al. [86] showed that, after treatment sessions and 3

Loading [MathJax]/jax/output/CommonHTML/jax.js e quality of patients enhanced significantly.

Results of this study showed that, 6 months after educational intervention, the average score of mental health of experimental group was significantly higher than control group. The educational intervention for promoting mental health included religious-based meaning treatment about the aim and meaning of suffer, life, death, pray and its effect on health. Mental health causes the improvement of life expectancy and social performance of patients. The religious beliefs enhance patients' resistance and it is effective on the reduction of pain, disappointment and anxiety. Hamid et al. [87] showed that, the religious-based treatment caused the enhancement of hope and life quality of women suffering from breast cancer. Nelson et al. [88] indicated that, high level of mental health with low level of some variables related to the mental disorders (such as disappointment, frustration and suicide) are related to each other. The results of Tatsumural et al. [89] revealed that, mental supports and religious sources are very important for compatibility of cancer patients with disease during treatment process. Hopko et al. [90] investigated the efficiency of cognitive behavioral therapy on disappointment, life quality, physical and entertaining activities, interpersonal problems and sleeping problems of patients and revealed that, after cognitive behavioral therapy, the mentioned problems reduced and life quality of patients enhanced. Results of Moghimian and Salmani [91] showed that, there is a direct and significant relationship between mental health and hope in cancer patients and health officials should be aware of the mental needs of patients and perform appropriate educational interventions.

Obtained results of present research showed that, 6 months after intervention, the average score of health promotion behaviors of experimental group was significantly higher than control group, while before the educational intervention, there was no significant differences between two groups and the level of health promotion behaviors was low. In this research, 6 aspects of health promotion behaviors including nutrition, physical activity, mental growth, health responsibility, stress management and interpersonal relationships were emphasized. The results of Basharpour et al. [63] indicated that, understanding about cancer and its complications plays an important role in cancer patients' interest for performing health promotion behaviors. In study of Taghdisi et al. [62], educational intervention caused health promotion of cancer patients. The results of this study are in a good agreement with the results of other similar researches [5, 9, 10, 20, 27, 28, 31, 35, 36, 92, 93 and 94].

Conclusion

Results of present study revealed that, educational intervention based on precede pattern causes the increase of knowledge, attitude, self-efficacy, enabling factors and perceived social supports in cancer patients and consequently, the increase of patients' hope, mental health and health promotion behaviors. According to the efficiency of precede pattern, performing educational interventions for cancer patients based on precede pattern is recommended. Also, according to the importance of families as the main caregivers of cancer patients, especial educational interventions should be designed for them. On the other hand, establishing and improving supportive organizations and educating how to deal with various mental problems are demanded. Some of the limitations of this research were lack of interest in some patients for participating in this research, problem in selecting patients due to their disease, lack of

Loading [MathJax]/jax/output/CommonHTML/jax.js cancer and self-reporting answers.

Abbreviations

PRECEDE: Predisposing, Reinforcing and Enabling Constructs in Educational Diagnosis and Evaluation

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Not applicable

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Not applicable

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• Conception or design of the work: AJ, YG, PAH • Data collection: TR • Data analysis and interpretation: AJ, PAH • Critical revision of the article: PAH • Final approval of the version to be published: AJ, PAH

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