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Research Article

Effectiveness of an Educational Intervention in Providing Knowledge about the Prevention of Thalassemia: An Effort to Reduce New Thalassemia Cases

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Abstract

Background and Objective: Genetic susceptibility screening for thalassemia trait carriers targeting students has never been introduced to the school community. Experience shows that the success of a population-based disease prevention program depends on community acceptance. This study aimed to assess the effectiveness of an educational intervention in changing the knowledge regarding thalassemia prevention. **Materials and Methods:** A quasi-experimental design by giving three different educational interventions consist of conventional, video animation and peer education on students of Senior High School in Jatinangor sub-district, west Java, Indonesia, about thalassemia prevention. The instrument used to measure the knowledge was a questionnaire containing 20 items was given before and after the educational interventions. **Results:** There was a statistically significant difference in the knowledge scores between the groups after educational intervention as determined by a one-way ANOVA test ($F = 49.187$, $p < 0.001$). A Tukey's *post hoc* test revealed that the video animation groups (14.95 ± 1.463) knowledge scores were significantly higher as compared to conventional groups (11.81 ± 2.488) and peer groups (14.88 ± 1.958). After the educational intervention in the students a statistically significant increase in their knowledge on thalassemia prevention was seen. **Conclusion:** The knowledge between the groups of educational intervention varied and video animation was found an effective method to increase thalassemia knowledge. Educational program with periodically sensitization sessions on thalassemia prevention are recommended, especially focusing at school community.

Key word: Educational intervention, prevention, thalassemia

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The principle of screening on the population, which has been developed since the 60's, has evolved and been modified based on the latest knowledge related to disease progression and prognosis¹. The severity of thalassemia patients likely to have a poor prognosis make the guidelines for innovation focusing on improving the quality of public health through pre-marital screening. Thalassemia major cause serious health, social and economic problems for patients and their families as well as requiring treatments that place a large enough financial burden on public health budgets².

Thalassemia is a genetic disorder that disrupts amino acids which forms one or more globin chains in red blood cell hemoglobin, causing reduction of or complete absence of hemoglobin chains formations³. In Indonesia, thalassemia is classified as the most common genetic disorder. Carrier of the beta-thalassemia gene ranges from 3-5% and may even reach 10% in some areas⁴. West Java province itself is ranked among the highest for thalassemia prevalence in Indonesia, which is as much as 42% of total population of around 6647 people⁴. Thalassemia patients require lifelong blood transfusion and iron chelating; therefore, prevention of thalassemia in the form of pre-marital screening is clearly needed. In addition to public health benefits, prevention of thalassemia is also believed to be cost-effective⁵.

According to the World Health Organization (WHO), the reproductive age refers to all people aged 15-49 years wherein a person is likely to marry and have children⁶. This definition indicated that it is very important to educate adolescents at senior high school level on thalassemia⁷. Marriage of teenagers under the age of 16 is still quite high, this is largely due to the wishes of parents. The stigma about unmarried adult women, worries about pregnancy or the introduction of premarital sex and poverty are the most frequent reasons. Therefore, the practice of child age marriage in Indonesia is complex and reflects the diversity of values and social norms in Indonesia⁸. This population has a high chance on getting married after completing their mandatory education and therefor is in need of early premarital counseling for thalassemia prevention.

Education is one of the thalassemia prevention strategies that have been established upon internationally. Knowledge of how diseases are inherited, early symptoms and prevention of thalassemia should be delivered through an attractive and acceptable medium⁹. In 2007, the population census recorded

that only 58% of students aged 13-18 years eligible for school are actually at school⁸. The influence of genetic factors on human health has been included in the school curriculum, so hopefully it can help create a community with high awareness of disease prevention. Currently, the government does not have a genetic pre-disposition screening program yet, particularly school-based thalassemia screening in order to suppress new thalassemia case incidence in Indonesia. School-based thalassemia education is expected to encourage students auto-screen themselves and their families for thalassemia. Community support is vital to the success of the screening program. This study seeks to determine the appropriate education method for high school students to encourage formation of a school-based genetic susceptibility screening program for thalassemia.

MATERIALS AND METHODS

This research was using pre-test/post-test design between three groups, namely conventional, video animation and peer education. The inclusion criteria was high school students in Jatinangor sub-district, Sumedang, West Java, who were willing to follow the research until the end and had been given permission from parents, while the exclusion criteria were students who have attended thalassemia counselling specifically and did not complete the questionnaire completely.

A new questionnaire developed from Focus Group Discussion (FGDs) by Research Center of Medical Genetics, Faculty of Medicine, Padjadjaran University, which has undergone pilot testing and statistical analysis to validate content, construct and reliability. The study was conducted in two stages. Stage 1 (assessment): After explaining the purpose of the study to each group and taking consent, a pretested and questionnaire was given to them to be filled out. It consisted of various questions to assess their knowledge regarding thalassemia namely: The problem statement, causes of disease, concept of genetic problems, individuals at potential risk due to inheritance concept, identified important symptoms, management of disease, complication and prevention strategy. Stage 2 (intervention): Conventional education was provided by lecture session on thalassemia prevention topics given for 20 min. Video animation was given in the classroom, no more than 9 min and the animation consisting of pictures and writings designed according to the FGDs results. The intervention was done purely by providing material through video without any lectures from researchers.

Peer education was delivery of the material through the selected peers who were trained on explaining thalassemia prevention using posters, brochures and presentation slides and also, they recruited 10 people each to educate in tutorial groups. After the session, the questionnaire was re-administered to them for each educational intervention.

The data was analyzed using statistical software Statistical Package for Social Sciences (SPSS) version 20. The knowledge responses were allotted scores (correct and 75% correct responses = 1, incorrect/blank response = 0). Chi-square, one-way ANOVA, Tukey's *post hoc* test and test of significance between two proportions (Z-test) were applied. Approval of the institutional ethics committee was taken prior to the commencement of the study.

RESULTS

As many as 180 students meet the inclusion criteria as respondents and are divided into three intervention groups. Only the peer education group had the complete number of respondents from the beginning to the end of the study, which was 60 people. In the conventional education group 6 people did not fill out the post-test sheet and from video educational group 7 people did not fill the data completely and 10 people did not finish the post-test. Most of the respondents are female and aged less than 16 years old, especially in the video and peer education groups (Table 1). Mother's level of knowledge in the three groups is mostly primary school and most of respondents never received information about thalassemia. The percentage thalassemia knowledge scores, respectively pre-intervention versus post-intervention of the participants on various aspects asked

in the three groups of educational interventions (Table 2). After the educational session, most of respondents in video animation and peer group interventions has a good understanding to identified various of thalassemia knowledge (>80%).

The interventions given to the three groups alike resulted in an increase in thalassemia knowledge in high school students in Jatinangor (Table 3). There was a statistically significant difference in the knowledge scores between the groups after educational intervention as determined by a one-way ANOVA test ($F = 49.187, p < 0.001$). A Tukey's *post hoc* test revealed that the video animation groups (14.95 ± 1.463) knowledge scores were significantly higher as compared to conventional groups (11.81 ± 2.488) and peer groups (14.88 ± 1.958). There was a statistically significant mean difference on both groups (educational video and peer education) compared to conventional education group with 95% confidence interval (-4.13 to -2.15) for video and media education and 95% confidence interval (-4.48 to -2.66) for peer education.

DISCUSSION

Screening programs on reproductive-age populations, genetic counseling and prenatal diagnosis have been introduced among at-risk populations in the Mediterranean region, including Sardinia, Italy, Greece and Cyprus¹⁰. This program was focused for parents who already had children with thalassemia or carrier. Although, this is very useful for reducing the incidence of new thalassemia cases, it still has limitations, especially in terms of costs and institutional commitments to have high attention towards thalassemia

Table 1: Characteristic of respondents (n = 157)

| Variables | Group intervention | | | | | |
|--|-----------------------|------|--------------------------|------|---------------------|------|
| | Conventional (n = 54) | | Video animation (n = 43) | | Peer group (n = 60) | |
| | No. | % | No. | % | No. | % |
| Age | | | | | | |
| ≤16 years old | 37 | 68.5 | 40 | 93.0 | 56 | 93.3 |
| >16 years old | 17 | 31.5 | 3 | 7.0 | 4 | 6.7 |
| Sex | | | | | | |
| Male | 37 | 68.5 | 4 | 9.3 | 23 | 38.3 |
| Female | 17 | 31.5 | 39 | 90.7 | 37 | 61.7 |
| Mother's education | | | | | | |
| Less than high school | 34 | 63.0 | 38 | 88.4 | 38 | 63.3 |
| Graduate high school | 20 | 37.0 | 4 | 9.3 | 16 | 26.7 |
| At least some college | - | - | 1 | 2.3 | 6 | 10.0 |
| Never participate in thalassemia prevention programs | 53 | 98.1 | 43 | 100 | 52 | 86.7 |

Table 2: Knowledge of the participants on various aspects of thalassemia before and after intervention

| | Conventional (n = 54) | | | | Video animation (n = 43) | | | | Peer-group (n = 60) | | | |
|--|-----------------------|-------------------|----------|--------|--------------------------|-------------------|----------|-------|---------------------|-------------------|----------|--------|
| | Pre-intervention | Post-intervention | p-value* | | Pre-intervention | Post-intervention | p-value* | | Pre-intervention | Post-intervention | p-value* | |
| | No.** | No.** | % | | No.** | No.** | % | | No.** | No.** | % | |
| Knowledge on thalassemia | 43 | 52 | 79.6 | | 33 | 41 | 76.7 | | 42 | 59 | 98.3 | |
| Magnitude of the problem | 45 | 52 | 83.3 | 0.008 | 35 | 41 | 81.4 | 0.013 | 50 | 59 | 98.3 | <0.001 |
| Causes of disease | 47 | 52 | 87 | 0.026 | 41 | 41 | 95.3 | 0.044 | 56 | 59 | 98.3 | 0.004 |
| Concept of genetic problems | 36 | 51 | 66.7 | 0.082 | 30 | 41 | 95.3 | 0.692 | 43 | 59 | 98.3 | 0.182 |
| Individuals at potential risk due to inheritance concept | 40 | 38 | 74.1 | <0.001 | 38 | 43 | 88.4 | 0.002 | 45 | 56 | 98.3 | <0.001 |
| Identified important symptoms | 41 | 53 | 75.9 | 0.667 | 40 | 42 | 93 | 0.028 | 53 | 60 | 100 | 0.006 |
| Identified management of disease | 49 | 46 | 90.7 | 0.001 | 40 | 41 | 93 | 0.308 | 54 | 58 | 96.7 | 0.136 |
| Identified complication | 50 | 53 | 92.6 | 0.375 | 42 | 43 | 97.7 | 0.5 | 48 | 60 | 100 | <0.001 |
| Identified prevention strategy | | | | 0.182 | | | | | | | | |

*Chi-square test, **No. of correct respondents

prevention. Health education is a process of community empowerment or independence with the aim of maintaining and improving health^{10,11}. Based on the previous studies, results showed that knowledge on thalassemia is one of the important things that must be understood by the community especially those who are at reproductive age, because it is associated with the incidence of thalassemia every year that still continues to increase. School-based health programs by health workers focus on students and proper delivery of information by district health promotion officers play an important role in improving students' knowledge to avoid marriage among peer of thalassemia carriers, thereby preventing the increase of people with thalassemia.

The present study revealed that more than 60% of students had mothers with poor educational background and the majority of students have never been tested for thalassemia (Table 1). These results go in line with a recent study conducted in University of Malaya, Malaysia found that lack of information to be the main cause of unawareness about thalassemia in community¹². The study also highlighted mis-conceptions that many were unaware (>40%) that both parents must be carriers in order to produce an affected child (knowledge on individuals at potential risk due to inheritance concept, Table 2), it is a fact that unawareness causes people to overlook screening tests for diseases¹³.

The study tried to use different educational methods; that is, by using conventional, video animation and peer education as an intervention. Once implemented, significant results were obtained ($p < 0.001$), in which there was an increase in the mean score of knowledge before and after intervention in the video education and peer education groups, compared to the conventional education group (Table 3, 4). The current study showed the similar results conducted in Italy using video as an instrument which was proven effective, while that of Italian study compared two groups given video interventions and provided education by reading information on paper¹⁴. The study on educational interventions in Iran shows the effect of peer education and conventional education on HIV/AIDS prevention behaviors is in accordance with the concept of the Health Belief Model. Meanwhile, there is a significant increase in knowledge on the peer education group compared with conventional education group¹⁵. However, other studies in India have shown an increase in the value of greater reproduction health knowledge in the conventional education group compared to the peer education group. Still, the two educational groups remain significant and effective in increasing the level of reproductive health knowledge¹⁶.

Table 3: Average knowledge scores among respondents

| Group intervention | Mean | Standard deviation | F-value | Significance* |
|--------------------------|-------|--------------------|---------|---------------|
| Pre-intervention | | | | |
| Lecture | 10.72 | 2.158 | 1.883 | 0.156 |
| Video animation | 11.53 | 1.968 | | |
| Peer group | 11.3 | 2.287 | | |
| Post-intervention | | | | |
| Lecture | 11.81 | 2.488 | 49.187 | < 0.001 |
| Video animation | 14.95 | 1.463 | | |
| Peer group | 14.88 | 1.958 | | |

*ANOVA test

Table 4: Comparison of mean difference of scores between lecture intervention and other methods

| Group intervention | Mean difference | Standard error | 95% confidence interval | Significance |
|--------------------------|-----------------|----------------|-------------------------|--------------|
| Pre-intervention | | | | |
| Lecture | | | | |
| Video animation | 0.813 | 0.441 | -1.86 to 0.23 | 0.160 |
| Peer group | 0.578 | 0.405 | -1.54 to 0.38 | 0.330 |
| Post-intervention | | | | |
| Lecture | | | | |
| Video animation | 3.139 | 0.418 | -4.13 to (-2.15) | < 0.001 |
| Peer group | 3.569 | 0.384 | -4.48 to (-2.66) | < 0.001 |

*Post hoc ANOVA (Tukey)

Therefore, it can be concluded that the video animation and peer education groups have better outcomes compared to conventional education. This is in line with Dale's Cone of Experience which states that a one-way learning process such as lecture can only provide about 20% of knowledge to the listener. However, if the learning process is made more active one i.e., with discussion, knowledge transfer can increase¹⁷ up to 50%. Peer education is also considered to be a useful educational tool among young people. Information can be conveyed through a language that is more easily understood and sensitive topics can be discussed freely. Peer educators are able to deliver materials in a language more easily understood and two-way learning enables respondents to better understand and remember the material. Therefore, the peer education method can be used in health education programs at high schools by preparing teachers to train some of their students to become peer educator. These students can enhance knowledge and awareness about thalassemia among their peers. In addition, this educational method can also eliminate the impression of a conveyor of information as an authoritarian speaker. Conversely, they assume that their peers are giving suggestions¹⁸.

The use of video prioritizes the sense of hearing and sight so students more easily capture information by combining audio and visual functions. Video intervention in this study can be used as a consideration to compare it with other methods, in order to find out which method is more effective to convey information. According to research results in Brazil,

the use of video as an educational media is an appropriate and recommended strategy¹⁹. Although the video has many advantages, one disadvantage is that the content of the video available does not always meet the needs and also requires expensive cost and time to produce.

The study has identified the need for strategies to prevent thalassemia and has important implications for the development of health care services. The findings showed teenage respondents expressed willingness to undergo thalassemia screening for themselves and their partners before marriage. Thus, screening promotion is likely to provide a good response from community. Health facilities with screening premarital must provide effective national education programs to promote testing.

CONCLUSION

The present results clearly document low level of knowledge about thalassemia in this respondent and video animation was found an effective method to increase thalassemia knowledge. The result of present study was highlight the urgency of implementing effective public educational programs nationally. Educational program with periodically sensitization sessions on thalassemia prevention are recommended, especially focusing at school community. These activities were the first step in the prevention of thalassemia; it is then expected that more parts of the population screen for thalassemia independently.

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