

# The Effectiveness of Booklet and Images Game Education in Anemia Adolescent Women on Anemia Prevention Knowledge, Attitudes and Behavior

Misroh Mulianingsih<sup>1,5</sup>, Suriah Suriah<sup>2</sup>, Healthy Hidayanty<sup>3</sup>, Ridwan Amiruddin<sup>4</sup>, Veny Hadju<sup>3</sup>, Dea Wulandari<sup>5</sup>, Andi Ummu Salmah<sup>6</sup>

Misroh Mulianingsih<sup>1,5</sup>, Suriah Suriah<sup>2</sup>, Healthy Hidayanty<sup>3</sup>, Ridwan Amiruddin<sup>4</sup>, Veny Hadju<sup>3</sup>, Dea Wulandari<sup>5</sup>, Andi Ummu Salmah<sup>6</sup>

<sup>1</sup>Doctoral Study Program, Faculty of Public Health, Hasanuddin University – INDONESIA.

<sup>2</sup>Department of Health Promotion and Behavioral Sciences, Faculty of Public Health, Hasanuddin University INDONESIA.

<sup>3</sup>Department of Nutrition, Faculty of Public Health, Hasanuddin University, INDONESIA.

<sup>4</sup>Department of Epidemiology, Faculty of Public Health, Hasanuddin University, INDONESIA.

<sup>5</sup>Mataram Yarsi College of Health Sciences, INDONESIA.

<sup>6</sup>Department of Biostatistics and Demographics, Faculty of Public Health, Hasanuddin University, INDONESIA.

## Correspondence

Misroh

Doctoral Study Program, Faculty of Public Health, Hasanuddin University, Mataram Yarsi College of Health Sciences, INDONESIA.

E-mail: misroh.yarsi@gmail.com

## History

- Submission Date: 11-07-2023;
- Review completed: 18-08-2023;
- Accepted Date: 21-09-2024.

DOI : 10.5530/pj.2024.16.193

Article Available online

<http://www.phcogj.com/v16/i5>

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## ABSTRACT

**Background :** Risk factors for anemia in adolescents are lack of education, as well as adolescents inability to apply the information obtained in daily life. Effective health education improving adolescents knowledge, attitudes, and behaviors related to health. **Objective :** This study aims to test the effectiveness of Booklet and Image game education in adolescent girls on knowledge, attitudes, and behaviors to prevent anemia. Participants were young women aged 15-19 years in the work area of the bayan Health Center and Gangga Health Center, who were selected through a screening process of 186 participants. each location had 93 respondents. **Method :** using a quasi-experimental two-group pre-test post-test design. In both groups, a pre-test was carried out furthermore, the intervention group was given health education through booklets and image game education, and the control group received health education with booklets. After the intervention was carried out, a post-test was carried out on both groups. **Results :** Coherence analysis showed that the control group (booklet), adolescent girl with anemia who received the booklet and image game education in the intervention group reported better knowledge about anemia ( $p=0,000$ ,  $n2 p=0,727$ ) attitudes about anemia ( $p=0,000$ ,  $n2 p=0,698$ ), and behavior of adolescent girls with anemia between the intervention group and the control group were much different after being given with anemia between the intervention group and the control group were much different after being given booklets and image game education compared to adolescent girls who only received booklets. **Conclusion :** A multifaceted approach to health education can have a significant positive impact, especially when it involves interactive elements. therefore, the same educational program can be applied in various places to increase the effectiveness of a program or activity goal

**Keywords :** Booklet, Image Game Education, Adolescent women, Anemia, knowledge, attitudes, behavior

## INTRODUCTION

Adolescence, as defined by the World Health Organization (WHO), is the transitional stage between childhood and adulthood, lasting from the ages of ten to nineteen. This stage of life characterized by rapid physical, cognitive, and emotional growth lays the foundation for lifelong health and well-being <sup>1</sup>.

A number of studies conducted around the world highlight that anemia is a public health problem that often occurs among adolescent girls <sup>2,3</sup>. The problem of anemia, especially anemia in adolescents, is one of the causes of stunting. Globally, one in four adolescents aged 10–24 years (~430 million) experiences anemia with the highest prevalence in low- and middle-income countries <sup>4</sup>.

Anemia is a health condition characterized by a low number of red blood cells or hemoglobin in the body, which can affect a person's quality of life. Among teenagers, especially young women, anemia is a significant health problem. According to the World Health Organization (WHO), approximately 1.62 billion people worldwide suffer from anemia, with a high prevalence in developing countries <sup>5</sup>. Adolescent girls are more susceptible to anemia due to physiological factors, such as

menstruation and greater nutritional needs during the growth phase <sup>6</sup>. Anemia reduces resistance to infection, decreased immunity, impaired physical growth and mental development, irregular menstrual cycles, and decreased physical fitness, work capacity, and school performance <sup>7</sup>.

In 2021, the prevalence of anemia in women of reproductive age (15–49 years) in the world will be around 29.9% and non-pregnant people aged 15–49 years will be 29.6%, including the teenage age category. The results of the 2018 Basic Health Research report, the prevalence of anemia in adolescent girls is around 27.2% aged 15–24 years and is a major health problem for adolescent girls <sup>8</sup>. The prevalence of anemia in NTB has reached 48% and North Lombok Regency over the last 3 years has tended to experience an increase in cases from 195 cases (2019), 332 cases (2020), 429 cases (2021), up to 630 cases or 59.74% of young women experiencing anemia. <sup>9</sup>.

The main risk factors for anemia are lack of education, lack of iron intake, poor economic status, poor personal hygiene, unhygienic toilets, and parasite infections <sup>10</sup>. As well as the inability to apply the information obtained in everyday life.

Effective health education is critical in improving youth's health-related knowledge, attitudes, and

**Cite this article:** Mulianingsih M, Suriah S, Hidayanti H, Amiruddin R, Hadju V, Wulandari D, Salmah AU. The Effectiveness of Booklet and Images Game Education in Anemia Adolescent Women on Anemia Prevention Knowledge, Attitudes and Behavior. *Pharmacogn J.* 2024;16(5): 1183-1187.

behavior, including their understanding of anemia classification. Innovative educational methods such as the use of booklets and educational games are interesting and interactive options to increase understanding. Booklets can provide information systematically and easily accessed, while educational games offer a fun and interactive learning experience, thereby increasing youth involvement in the learning process.<sup>11</sup>

Previous research shows that creative and interesting educational approaches can encourage positive changes in attitudes and behavior among teenagers, including in terms of managing their health.<sup>12</sup> Improving the knowledge, attitudes and behavior of teenagers can be done through health education using methods and media that are appropriate to the target. One of the media that can be used is Booklets and *Image Games Education*. *Image Games Education* is an interesting type of game where the images provided will be arranged according to the instructions given. Therefore, it is important to investigate the effectiveness of educational *booklets* and games in improving the knowledge, attitudes and behavior of adolescent girls regarding anemia classification.

## MATERIALS AND METHODS

### Participants

Participants are young women aged 15-19 years in the working areas of the Gangga Health Center and Bayan Community Health Center, who were selected through a screening process. A total of 186 eligible participants were recruited to become respondents in this study. Subjects in this study were divided into two groups, namely the intervention group and the control group. The intervention group was given intervention booklets and educational games about anemia prevention. Meanwhile, the control group received booklet intervention. Inclusion criteria are: 1) young women aged 15-19 years have a nuclear family; 2) nuclear family living in one house; 3) the menstrual period has entered; 4) experiencing anemia based on examination results; and 5) live in the working area of the Gangga or Bayan Health Centers. The reason for selecting respondents is that anemia is more common in Adolescent girls are a vulnerable group because they grow up and need more nutrition, especially iron.

### Research design and procedures

This research was conducted using a *quasi-experimental design*. To prevent treatment contamination in the control group when using an experimental research design, we used a non-equivalent control group and a *pre-test and post-test quasi-experimental design*. In this research, the way to use a quasi-experimental design is to divide the sample into two groups, namely the intervention group and the control group. In both groups, a *pre-test was carried out*. Next, the intervention group was given counseling via booklets and educational games, and the control group received counseling via booklets. After the intervention was implemented, a *post-test was carried out* on both groups.

The population in this study were all young women in the working area of the Gangga Community Health Center and Community Health Center Bayan of 429 people. The sample size was calculated using the mean difference test from Lameshow et al. So the samples in the intervention and control groups each amounted to 93 teenage girls<sup>13</sup>. The intervention group is a group of young women in the working area of the Bayan Community Health Center, while the control group of teenage girls was in the working area of the Gangga Community Health Center. In this study, *non-probabilistic sampling* techniques were used with a *purposive sampling approach* in both groups, namely the intervention group and the control group. The detailed steps in this research are shown in Figure 1.

The research instrument used to reveal knowledge is a questionnaire or closed questionnaire using the Guttman Scale. This study uses the Guttman scale because the researcher wants to get a firm answer to the knowledge of anemia in adolescent girls obtained formally and informally, with a total of 20 questions. Questionnaires or questionnaires used to reveal attitudes using a closed questionnaire in the form of a checklist (✓). To measure attitudes, a Likert Scale is used, with a total of 11 question items. The instrument that will be used to reveal behavior is the same as the attitude instrument, namely a questionnaire or closed questionnaire using a Likert scale with a total of 10 questions consisting of 7 positive statement items and 3 negative statement items. A *booklet* containing information about adolescent growth and development, the definition of adolescent anemia, causative factors, prevention methods, treatment steps, the risk of short-term and long-term anemia, the role of the family in adolescent growth and development and prevention of adolescent anemia. *Image Game Education*: is a learning media in the form of a game where the educator prepares a playing media in the form of cardboard paper and on the paper there are already pictures of good/bad attitudes/behaviors of adolescents in responding to anemia. Before the game is played, the educator will divide the team first after that the educator explains the game technique. Based on the game to be played, pictures of the criteria for good/bad attitudes and behavior of adolescents with anemia are arranged, then pictures of the impact of anemia and preventive solutions provided from the pictures are rearranged. After all the pictures are arranged, each team member divides themselves to explain all the pictures they have arranged<sup>14</sup>. During the game, the participants will divide the tasks and without them realizing it, they will feel comfortable receiving learning by playing, their memory will be longer than with the provision of ordinary material because their cognitive will store happy memories longer and they interact with each other between teams exchanging ideas or knowledge<sup>15,16,17</sup>.

### Anasis

Analysis was carried out using Stata software version 17 licensed by Gadjah Mada University (UGM). Before analyzing research data, normality and homogeneity tests were carried out for all research variables in both the intervention and control groups. The data normality test was carried out using the *Kolmogorof-Smirnov test test* [KS] ( $n > 50$ ). The data normality test for knowledge resulted in  $KS = 0.99707$ ,  $df = 0.251$ ,  $p = 0.99673$ ; for attitudes it produces  $KS = 0.99495$ ,  $df = 0.433$ ,  $p = 0.95024$ ; for behavior produces  $KS = 0.95891$ ,  $df = 3.523$ ,  $p = 0.49021$ . Furthermore, the homogeneity test of data on knowledge, attitudes and behavior of anemic adolescents in the intervention and control groups showed a  $p$  value  $> 0.05$ . Furthermore, analysis of covariance (ANCOVA) with pre-test  $t$  scores as a covariate was used for unbiased intervention estimation by assessing inter-group differences. A  $p$  value  $< 0.05$  was considered a significant difference, and vice versa. Partial eta squared ( $\eta^2$ ) was calculated to assess the effect size where a value of  $\eta^2 < 0.01$  was considered a very small effect,  $0.01 \leq \eta^2 < 0.06$  was considered a small effect,  $0.06 \leq \eta^2 < 0.14$  is considered a medium effect,  $\eta^2 \geq 0.14$  is considered a large effect.

### Research result

The distribution of respondent characteristics is the basic characteristics of respondents obtained through initial tests. The characteristics of respondents in this study were knowledge, attitudes and behavior of anemic adolescent girls (Table 1).

From the results of the analysis in Table 1, the characteristics of adolescent girls' knowledge scores about anemia have a moderate score. Likewise, the attitude scores of young women regarding anemia in the study were relatively moderate average scores. For adolescent girls' behavior regarding anemia, the average score is relatively low.

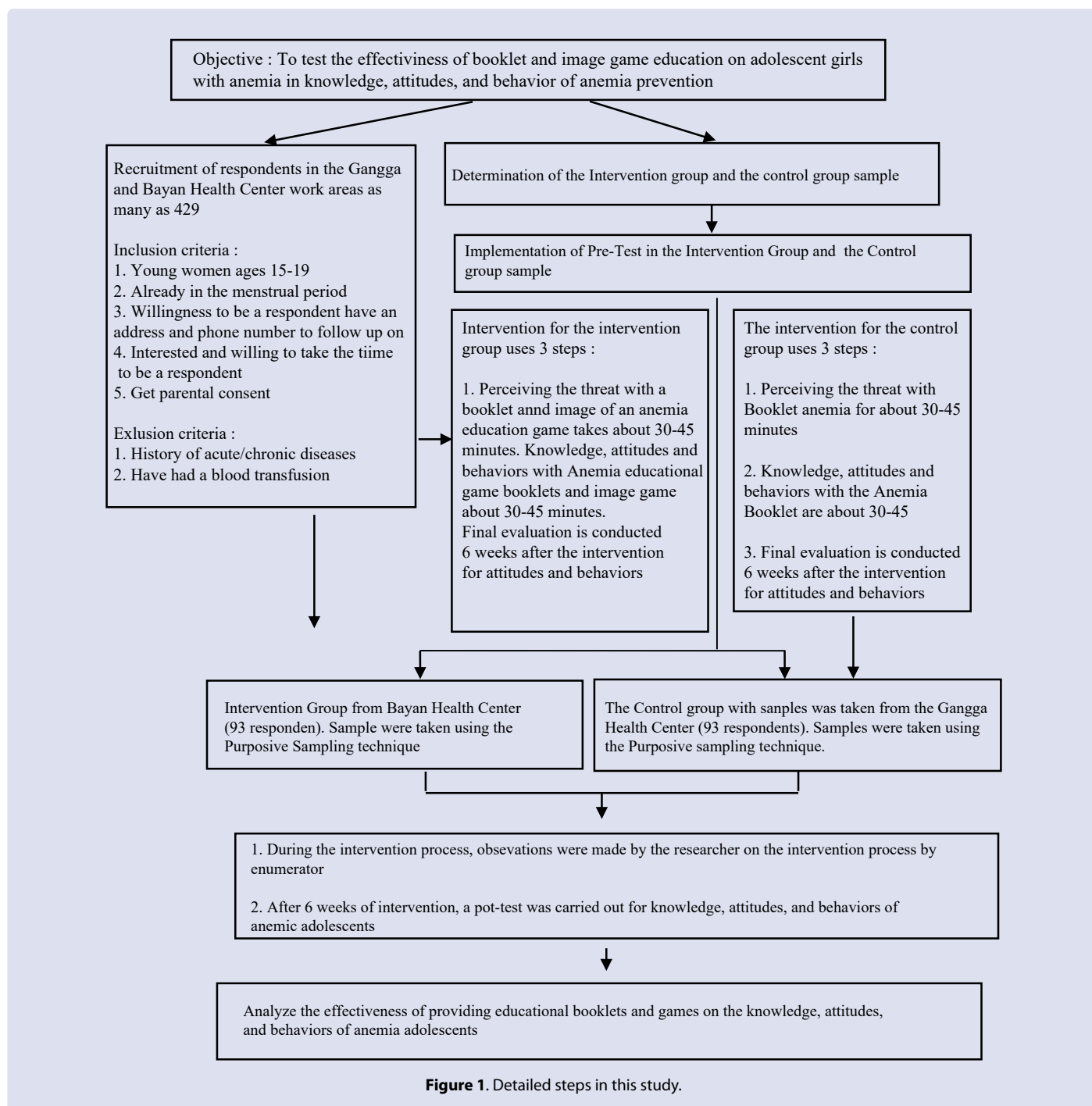


Figure 1. Detailed steps in this study.

Table 1. Distribution of basic characteristics of respondents based on research variables.

Variable	Mean ±SD	Min	Ma k
Knowledge scores of adolescent girls about anemia	14.4 ± 2.22	10	18
scores of young women about anemia	32.8 ±3.81	22	41
scores of adolescent girls regarding anemia	26.6 ±3.52	20	38

Source: Baseline Data

Table 2. ANCOVA results with pre-test scores as covariate.

Variable	F	p-value	η <sup>2</sup> p
Knowledge	58.73	0,000	0.727 (large effect size)
Attitude	24.31	0.0 00	0.698 (large effect size)
Behavior	23.90	0.0 00	0.679 (large effect size)

Note: ANCOVA with post-test scores as dependent variable, intervention or control group as independent variable, pre-test scores as covariate.

The results of the normality test of data on knowledge, attitudes and behavior of *pre-test* and *post-test* anemic adolescent girls from the *intervention and control groups* showed the *p* value.  $> 0.05$ . From the results of the normality test analysis, it can be concluded that all data for this research variable is normally distributed. The results of the homogeneity test of data on knowledge, attitudes and behavior of young women in the intervention and control groups gave a *p* value  $> 0.05$ . From the results of the analysis test, it can be concluded that the data is normally distributed and homogeneous, so the statistical test used is the *t-test*.

### Analysis of covariance (ANCOVA) with pre - test score as covariate

In Table 2, the *p* values and partial eta squared values obtained from ANCOVA with pre-test scores as a covariate are presented.

Table 2 show that compared to the control group (booklet), adolescent girls who received booklets and educational games in the intervention group reported better knowledge about anemia ( $p = 0.000$ ,  $\eta^2 p = 0.727$ ), attitudes about anemia ( $p = 0.000$ ,  $\eta^2 p = 0.698$ ), and attitudes about anemia ( $p = 0.000$ ,  $\eta^2 p = 0.679$ ). This means that the knowledge, attitudes and behavior scores of young women between the intervention group and the control group were much different after being given booklets and educational game images compared to young women who only received booklets.

## DISCUSSION

This research examines the effect of anemia booklets and image game education on the knowledge, attitudes and behavior of young women regarding anemia prevention. The results of this study showed that young women who experienced anemia and received intervention in the form of *booklets* and *image game education* had better knowledge, attitudes and behavior regarding anemia prevention compared to the control group who only received booklets. This significant difference can be seen from the *p*-value  $< 0.05$  and the high effectiveness value ( $\eta^2 p$ ), where  $\eta^2 p$  indicates a large effect size ( $\eta^2 p = 0.727$  for knowledge,  $\eta^2 p = 0.698$  for attitudes, and  $\eta^2 p = 0.679$  for behavior).

### The effectiveness of providing educational booklets and games on knowledge about preventing anemia

Better knowledge in the intervention group shows that the use of *educational image games* together with *booklets* can significantly increase adolescent girls' understanding of anemia. This is in line with previous research which states that interactive learning methods such as games can increase student involvement and strengthen the learning process.<sup>18</sup> The use of digital media in health education can also increase interest and motivation for learning, so that information about anemia can be conveyed more effectively.

The use of *image game education* in the context of health education serves to create a dynamic learning environment. Known as an active method, game-based learning can facilitate a space for students to directly experience the reality of what they are learning, so that the knowledge they gain will stick more closely. In addition, the use of game media in health education increases the interest and motivation of learning, by providing opportunities for teenagers to learn in ways they find interesting<sup>19</sup>. Research also shows that information conveyed in an interactive way tends to be easier to remember,<sup>20</sup> which makes information about anemia prevention, contained in educational *booklets* and *game images*, more absorbed by the target audience.

### The effectiveness of providing educational booklets and games on attitudes about anemia prevention

Apart from knowledge, the attitude of young women towards anemia also shows significant differences. The application of educational games

can form positive attitudes by providing a more realistic and applicable context regarding the importance of treating anemia. This positive attitude is important in efforts to prevent and manage anemia, where confidence and understanding influence subsequent actions taken by individuals<sup>21</sup>

The booklet, as an informative educational tool, provides information about anemia, its causes, effects, and preventive steps that can be taken. It is hoped that this information can increase the knowledge of young women regarding the importance of preventing anemia. However, on the other hand, *image game education* offers a more interactive and interesting approach. Through game elements, young women not only learn, but are also actively involved, which can strengthen understanding and skills in recognizing and treating anemia<sup>22 14</sup>

The importance of a positive attitude in preventing anemia cannot be underestimated. A good attitude is usually directly proportional to the preventive actions taken. In this context, when young women have a positive attitude towards preventing anemia, they tend to be more concerned and proactive in maintaining their health. This has the potential to lead to increased awareness of healthy eating patterns, the importance of consuming iron supplements, and regular health checks. Thus, building a more positive attitude among young women towards anemia through educational media such as games can contribute significantly to efforts to prevent and manage anemia among young women and be an indicator that they tend to be more concerned and proactive in maintaining their health.

### The effectiveness of providing educational booklets and games on behavior regarding anemia prevention

The results showed that the intervention group experienced a significant increase in knowledge and attitudes compared to the control group. Knowledge about foods rich in iron and the importance of consulting with health workers has increased significantly among participants involved in *image game education*. These results are in line with social learning theory<sup>23,24</sup>, which states that individual knowledge and attitudes can impact behavior change.

Young women who receive more information than just a booklet tend to be braver to take concrete steps to prevent anemia. They eat nutritious food more often and are more active in consulting health workers after taking part in fun educational games. This approach proves that the combination of interesting educational material and well-designed interactions can increase the effectiveness of learning and change behavior.

<sup>25</sup>also revealed that game-based interventions can increase students' motivation and understanding of health topics. This reflects that a pleasant learning experience can strengthen memory and encourage individuals to apply the knowledge gained into daily practice and can increase awareness among young women of the importance of maintaining personal health, especially regarding anemia.

## CONCLUSION

Providing educational booklets and games effectively increases knowledge, attitudes and behavior regarding anemia prevention among young women. This research shows that a multifaceted approach to health education can have a significant positive impact, especially when it involves interactive elements. Therefore, the same educational program can be implemented in various places to increase awareness of the importance of preventing anemia.

## THANK-YOU NOTE

Thank you to the Government of North Lombok for the permission and location for this research.

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**Cite this article:** Mulianingsih M, Suriah S, Hidayanti H, Amiruddin R, Hadju V, Wulandari D, Salmah AU. The Effectiveness of Booklet and Images Game Education in Anemia Adolescent Women on Anemia Prevention Knowledge, Attitudes and Behavior. *Pharmacogn J*. 2024;16(5): 1183-1187.