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Assessment on Knowledge of Red Yeast Rice Among Public in Cyberjaya, Malaysia: A Cross-Sectional Study

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Abstract: Red yeast rice has been used for centuries in traditional Chinese medicines. It was proven that red yeast rice is safe and efficacious in lowering the cholesterol level thus, helping to reduce the risk of cardiovascular diseases in an individual. This study aims to assess the knowledge of red yeast rice among the public in Cyberjaya and to identify the associated factors on knowledge about red yeast rice. A cross-sectional study was conducted that involved 278 respondents in Cyberjaya. A pre-tested and structured questionnaire was used to collect information. It consisted of questions about demographics and knowledge about red yeast rice. Data were analyzed using Statistical Package for the Social Sciences version 25.0. The mean score (SD) for knowledge was only 1.25(0.497) out of 10 which shows that majority of the respondents have poor knowledge regarding red yeast rice. This study also discovered that only the occupational status of the respondents affected their knowledge of red yeast rice (p<0.05). Respondents who are working have higher knowledge of 3.16 (1.96) than those who not working 2.65 (1.46). This shows an individual's knowledge can be affected by environmental influence in working place. In conclusion, the public need more comprehensive education programs regarding the use of red yeast rice by pharmacists and healthcare providers.

Keywords: Knowledge; Red Yeast Rice; cholesterol; public; traditional

1. Introduction

World Health Organization (WHO) defined cardiovascular diseases (CVDs) as a group of disorders that involve the heart and the blood vessels as well being the number 1 cause of death globally[1]. Hyperlipidemia, as one of the cardiovascular risk factors, causes an estimated 4.4 million deaths due to ischemic heart disease every year worldwide[2]. According to the Department of Statistics Malaysia, it was stated that ischemic heart disease has remained a main cause of death for the past 10 years. Ischemic heart disease was recorded as the highest percentage to cause deaths in Malaysia with 13.5%, followed by pneumonia at

12.0%, cerebrovascular diseases at 7.1%, septicemia at 6.1%, and transport accidents at 5.6%[3]. Data from the Cholesterol Treatment Trialists' Collaborators[4] demonstrated that a 25% reduction in major vascular events and 9% reduction in all-cause mortality could be achieved with a drop in 1.0 mmol/l of serum low-density lipoprotein cholesterol (LDL-C).

A 2013 Cochrane review showed a 25% reduction in cardiovascular disease events with the use of statin which was the first line of lipid-lowering therapy known efficacy for reducing cardiovascular morbidity and mortality[5]. Nevertheless, side effects of statins such as myalgias and muscle weakness, fatigue feeling, and liver impairment render the use among patients[6]. Therefore, an alternative method is needed to overcome this issue. Currently, more attention is being paid to alternative therapies such as nutrients and Chinese herbal medicine. A study by the China Coronary Secondary Prevention Study trial showed that red yeast rice could reduce 46% of nonfatal myocardial infarction and coronary deaths[7]. Red yeast rice (RYR) was a nutraceutical that is originated in China and made by fermenting white rice with the yeast *Monascus purpureus* for 10 days at a temperature of 29˚C to 32˚C[8]. In the ancient time, RYR was used as a medicinal function for the treatment of indigestion and diarrhea, post-partum, improving blood circulations, lowering blood cholesterol and blood pressure, and may possess anti-inflammatory, antidiabetic, anticancer, and osteogenic properties[9,10].

A meta-analysis analysis study showed a reduction of 1.02 mmol/L of LDL-C after 2 to 24 months of treatment compared to placebo[11]. Moreover, various clinical studies suggest that RYR has the potential to reduce serum LDL-C levels by 10% to 33%[12,13]. Cardiovascular events can be reduced with a reduction in LDL levels. A study shows that every 1% reduction in LDL-C levels correlates with $a > 1\%$ reduction in the relative risk of CV events[14,15]. Despite knowing the benefits of RYR, its use among the public is still not common. Therefore, it is pertinent to evaluate the knowledge of the public about this supplement.

2. Materials and Methods

2.1 Study Population

A cross-sectional study facilitated by convenient sampling technique was conducted among the public in Cyberjaya city in Malaysia. A sample size of 384 was estimated by Raosoft software with a margin of error of 5% and $p=q=0.05$ at 95% confidence interval (CI). The sample size calculated was inflated to 10%, taken into consideration for subject withdrawal or incomplete data. This study included all respondents who were aged 18 years and above. While respondents who refused to give their consent in completing the survey

and unable to complete the questionnaire either in Malay or English language were excluded from the study.

2.2 Study Instrument

A self-administered questionnaire was used as research tool to evaluate the knowledge among the public about red yeast rice. The questionnaire was adopted and adapted from previous literatures[16,17]. The questionnaire consists of two sections (Part A and B). Part A assesses the socio-demographic characteristics of the respondents such as age, gender, ethnicity, education level, occupation, and medical history. Meanwhile part B had 10 multiple questions that assessed respondents' knowledge on RYR. Each correct answer was given a score of 1 while each wrong or don't know answer was given a score of 0. The knowledge score, as shown in Table 1, was interpreted as poor, moderate and good knowledge. On assessment, scores that were below than 3 of total score would be categorised as poor knowledge, followed by score of 4 to 6 as moderate knowledge whereas 7 or higher as good knowledge[18]. A pilot study with 20 potential respondents was done. The reliability of the questionnaire was assessed using the Cronbach's alpha which is the most common tool to be used to measure internal consistency[19]. The Cronbach's alpha results obtained for assessing knowledge on RYR is 0.871. The values obtained from Cronbach's alpha shows that the questionnaire is reliable.

Table 1. Knowledge sharing

Score	Knowledge
Below than 3	Poor knowledge
4–6	Moderate knowledge
7 or higher	Good knowledge

2.3 Data Collection

The self-administered questionnaire was handed to the public of Cyberjaya personally by the researcher and confirmed consent was also taken. The questionnaire then was collected back after the respondents completed the survey. Any information given by the study subjects was kept private and confidential.

2.4 Data Analysis

All continuous variables were expressed as mean ± standard deviation. Categorical variables were expressed as a percentage. General linear model was used to find the factors associated with the mean knowledge score. Data ware analysed using Statistical Package for Social Sciences (SPSS) Version 26.0. The significant level was set at $p < 0.05$.

2.5 Ethics Statement

The research was reviewed and approved by the University Human Ethics Committee.

3. Results

Around 278 respondents out of 384 had voluntarily participated in this study and this showed a response rate of 72%, which was acceptable. A response rate of 65% or more is acceptable and desirable for researchers using on-paper surveys [20]. Of the 278 respondents, the majority were males, 148 (61.5%) and 130 were females (46.8%). The mean age of the study population was 35.89 (14.17) years. More than half of the respondents who participated were Malay (59%). Around 54% of the respondents have tertiary education and only 29.9% were unemployed. The demographics of the study population are presented in Table 2. Meanwhile, the knowledge score among the study subjects was expressed in Table 3. Surprisingly, the mean score for the knowledge score was very low at 1.25 (0.497) with a maximum score of 10. Most of the respondents had a poor knowledge with 77.7% (n = 216). Furthermore, 54 (19.4%) respondents had moderate knowledge with a score of between 4–6 and only 8 (2.9) respondents had good knowledge about the RYR. Despite having poor knowledge of RYR, most of the respondents answered correctly the questions about the use of red yeast rice, the role of red yeast rice, and the storage condition of RYR once the product is opened. However, for the other 7 questions in the survey, the respondents answered wrongly which shows that the respondents still lack knowledge regarding RYR. The respondents always mistakenly thought that the RYR was from plants instead of *Monascus sp.*, a species of fungus. A general linear model was performed to check on the association of knowledge mean scores and demographic factors. The results shown in Table 5, indicated only occupation status was a significant factor with employed respondents having higher knowledge scores.

Table 2. Demographic details of the study population

Socio-demographic factors	**Mean (SD)**
Age	35.89 (14.173)
	***n* (%)**
Gender	
Male	148 (53.2)
Female	130 (46.8)
Ethnicity	
Malay	164 (59.0)
Non-Malay	114(41)
Education Level	
No Formal Education and Primary	24 (8.7)
Secondary	104 (37.4)
Tertiary	150(54)
Occupation	
Employed	195(70.1)
Unemployed	83(29.9)

Table 3. Knowledge Score on Red Yeast Rice among study subjects

Characteristics	Frequency (%) *n*=278	Mean (SD)
Knowledge score		1.25 (0.497)
Poor knowledge (0-3)	216 (77.7)	
Moderate knowledge (4-6)	54 (19.4)	
Good knowledge (7-10)	8 (2.9)	

Table 4. Participants' knowledge of Red Yeast Rice

Scope	Frequency (%) *n*=278	
	Correct answer	**Wrong answer**
1. The source of red yeast rice	45 (16.2)	**233 (86.8)**
2. Active ingredient of the red yeast rice	21 (7.6)	**257 (92.4)**
3. The use of red yeast rice	**194 (69.8)**	84 (30.2)
4. Conventional medicines with similar component.	19 (6.8)	**259 (93.2)**
5. Role of red yeast rice	**162 (58.3)**	116 (41.8)
6. Benefits of red yeast rice	81 (29.1)	**197 (70.9)**
7. Recommended dose for red yeast rice in a day.	30 (10.8)	**248 (89.2)**
8. Herbs interaction of the red yeast rice		
9. The common side effect of red yeast rice	16 (5.8)	**262 (94.3)**
10. The storage condition for red yeast rice products after you opened it	10 (3.6)	**268 (96.4)**
	200 (71.9)	78 (28.1)

Table 5. Factors associated with knowledge of Red Yeast Rice

Variable	Mean ±SD	*p*-value
Age	2.08(0.07)	0.701
Gender		
Male	2.66 (±1.34)	0.141
Female	2.95 (±1.92)	
Ethnicity		
Malay	2.76 (±1.87)	0.607
Non-Malay	2.86 (±1.26)	
Education Level		
No Formal Education and Primary	2.25 (0.94)	0.157
Secondary	2.74 (1.00)	
Tertiary	2.80 (2.03)	
Occupation		
Employed	3.16 (1.96)	0.018*
Unemployed	2.65 (1.46)	

*General linear model, p<0.05 statistically significant**

4. Discussion

Even though RYR had been used for centuries as an alternative medicine and a lot of information have proved on its safety and efficacy, it is still unknown to the society about the existence of the RYR. Previous studies showed that major supplements users were elderly, hence they will have higher knowledge towards supplements[21]. However, age was not the significant factor to knowledge in this study. Female has more knowledge score than male because women may be more health conscious than men[22]. Studies have also shown that male has poor health seeking behaviour as they are concerned to be the bread earners of the family[23].

It was reported that RYR was known to be Chinese traditional medicine, so it was predicted that the Chinese respondents to have more knowledge on red yeast rice[24]. The mean knowledge score was high among non-Malay group compared to the Malay group; however the test was not significant. Occupational status of the respondents is one of the factors that contribute to the higher knowledge score. This is similar to another study, which reported that working adults possessed a higher knowledge score towards the use of antibiotics and adopted a more positive attitude towards it[25]. This might be attributed to the

high level of health literacy among the employed[26]. Besides that, a study proves that an individual could be easily affected by the environmental influence such as their friends and family[27]. Socialization with another individual is important as it can influence and increase their knowledge[28].

5. Strength and Limitations

This study has several limitations that need to be addressed. This study was conducted in one public area. Therefore, it may not be possible to generalize the results of this study since other populations may have different behaviours. Besides that, as this study was conducted as a survey, some potential recall bias and social-desirability bias might occur. To our best knowledge, this study was one of the first studies which assessed the knowledge of the public towards RYR. Future studies should employ systematic stratified sampling to ensure generalizability of the findings

6. Conclusions

This study highlights a very important but neglected knowledge about RYR. As the study shows a poor knowledge on RYR despite its effectiveness in reducing blood cholesterol, we, therefore, recommend that necessary steps such as conducting awareness campaigns or educating the general population through media and health professionals can be done. Special training or workshops need to conduct for health caregivers, as to which explanation/description can be provided to patients.

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