

A Study of Willingness Attitude and Factors Influencing Screening for Fava Bean Disease in Younger Children

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The aim of this study was to investigate the factors influencing parents' willingness to screen their children aged 1 to 9 years for fava bean disease. The study was conducted in Nanning, Guangxi, China, using a cross-sectional survey method, and data were collected from 963 parents through a questionnaire. The results showed that 39.7% of parents were willing to screen their children, while 60.3% expressed reluctance. Factors affecting willingness to screen included parents' age (41 to 50 years old were more willing), whether they themselves had fava bean disease, family history, and level of knowledge about fava bean disease. The higher the level of knowledge, the more inclined parents were to screen their children. The study recommends increasing screening participation by improving public education, reducing screening costs, and optimizing screening services to reduce the impact of Fava bean disease on children's health.

Keywords: Fava bean disease, Child Screening, Parental willingness, Health Education

Background

Fava bean disease, also known as G6PD deficiency, is an allergic disease induced by the absence of a specific enzyme, G6PD, in red blood cells caused by a faulty gene¹. G6PD plays a vital role in maintaining cellular oxidative balance and protecting red blood cells from oxidative damage. A deficiency in this enzyme can lead to acute hemolytic anemia upon exposure to certain triggers, such as fava beans².

Symptoms of the onset of fava bean disease include acute hemolytic anemia, general malaise, fatigue, chills, fever, dizziness, headache, anorexia, nausea, vomiting, and abdominal pain³.

Urine may become reddish-yellow during an acute episode, and there is a significant drop in blood pressure and a weak and rapid pulse. Among them, acute hemolytic anemia is extremely dangerous for children aged 1 to 9 with poor physical functioning and can lead to death in a short period of time.

In Malaysia, the overall prevalence of G6PD deficiency among males was 4.7%, with China being 6.0%. In China, most G6PD cases are reported in the Guangxi province. Guangxi province is located in the far south of China, with a population scale of about 50 million⁴. According to Guangxi Hospitals, the rate of carrying G6PD deficiency is over 15% in Guangxi, with a symptomatic rate of between 8% and 11%. Guangxi is one of the most affected regions nationally, making it a priority area for G6PD screening and prevention strategies. Nanning, as the capital of Guangxi, represents a key urban center for implementing public health interventions.

Previous research has mostly focused on the relationship between malaria and fava bean disease or on chemical interventions that could mitigate the effects of this genetic disorder. However, there is barely anyone paying attention to the children with fava bean disease. Children between the ages of 1 and 9 years old are often at risk if they do not know if they have a fava bean disease, as any negligent exposure to allergens can lead to more severe symptoms than in adults⁵. It's important to note that screening is the most common method for early detection of fava bean disease.

Most importantly, it is commonly found in children under the age of three, who are weak in resistance and whose body functions are not up to adult standards and may lead to death in the event of an outbreak. As a result, the prevention and control of G6PD Disease is even more important for this particularly vulnerable group of young children. However, screening tests are often based on the willingness of the parents. If a child is not screened in time, exposure to harmful substances without knowing the child's condition could lead to serious health consequences.

It is important to note that for children, the decision to be screened for fava bean disease is often determined by parental tendency. Therefore, this study focuses on understanding parental willingness to have their children screened for fava bean disease. The aim is to reduce morbidity by investigating willingness and identifying relevant influencing factors.

Material and Method

Type of Research

This is a cross-sectional study.

Selection of research subjects

The study area was Nanning City, Guangxi Province. The scope of distribution and the main target of the survey were parents with children aged 1-9 years old at home who were willing to participate in the screening or not. The duration of the survey was one month uninterrupted. Due to certain limitations, the scope of the study is limited to the workers in RT-Mart and their families.

Data collection

Data was collected in the form of a questionnaire. Based on the screening policy of Nanning City, we contacted the distribution of RT-Mart in the Nanning City area and distributed the questionnaires through electronic form. The questionnaire contains questions of Socio-demographics, knowledge level about fava bean disease, factors influencing the willingness to have children screened for fava bean disease. The distribution of the questionnaire was limited to RT-Mart workers and their families.

The questionnaire consisted of several sections:

- **Demographic Information:** Respondents were asked about their relationship to the child (whether they were the guardian of a child aged 9 or younger), gender, age, educational level, occupation, and monthly income.
- **Knowledge of Fava Bean Disease:** Key questions included whether they were aware that the disease could be hereditary or whether certain foods or medications could trigger symptoms. The knowledge questions were designed to cover both general understanding and specific risk factors to comprehensively evaluate participants' awareness levels. Simple yes/no/don't know formats were used to ensure clarity and minimize response burden.
- **Screening Willingness:** Respondents were asked if their child had been screened for fava bean disease and whether they would be willing to allow their child to undergo screening. Additionally, those who were unwilling to screen their child were asked to provide reasons for their reluctance. This section aimed to capture both actual behavior and potential attitudes toward screening, helping to identify barriers to participation.

The questionnaire was distributed online through the WenJuanXing platform, a widely used Chinese online survey tool that allows for easy design, distribution, and data collection of

electronic questionnaires. The platform supports various question types, including multiple-choice, yes/no, and open-ended responses, and ensures anonymity by not tracking participant identities. The responses were collected anonymously, maintaining confidentiality and privacy. To enhance data quality, simple and unambiguous language was used throughout the questionnaire, and question sequencing was arranged logically from demographic information to knowledge evaluation and finally to behavioral willingness.

Statistic Analysis

After the survey, the data were first given through the investigator's statistics. The data contains the decision made by the respondents (whether to participate in the screening of fava bean disease or not) and the related factors, which are presented in percentages and specific figures. Continuous variables were described by the mean and standard deviation (SD), and Categorical variables were described by percentage (%).

In addition, univariate regression analysis was conducted to initially evaluate potential factors that might affect the willingness to have their children screened, including demographic characteristics, cognition and overall attitude. Finally, the variables with $P < 0.1$ in the univariate regression analysis were included in the multiple logistic regression analysis, where $P < 0.05$ was regarded as a significant difference. Associations were estimated and interpreted with odds ratio (OR) and 95% confidence interval (95% CI). All data was processed by SPSS software (version 26.0) for statistical analysis.

Result and Analysis

Socio-demographic characteristics

A total of 963 valid questionnaires were analyzed in this study, of which 382 (39.7%) indicated that they were willing to or had already had their children screened for fava bean disease, while 581 (60.3%) indicated that they were not willing to have their children screened. The questionnaire was distributed to a total of 970 eligible respondents, yielding a response rate of 99.3%. The WenJuanXing platform used for distribution was configured such that all questions were mandatory, preventing submission of incomplete responses and ensuring full data integrity across all variables. Most of the respondents were female (73.4%), most of them did not have fava bean disease themselves (86.9%), and most of them also did not have a family history of fava bean disease (82.3%). The age of the participants ranged from 21 to 60 years old, with a median age of 31 to 40 years old, 2.9% of participants aged 21-25 years old, most of the participants were middle-aged people aged 31 to 50 years old, totaling 88.1%, and older people aged 50 years old and above accounted for 2.9%.

Table 1. Data graph of Socio-demographic characteristics of participants in the survey of willingness to have children screened for fava bean disease

	Total (n/%)(n=963)	Not willing (n/%)(n=581)	Willing (n/%)(n=382)	P-value
Gender				0.030
female	707(73.4)	412(70.9)	295(77.2)	
male	256(26.6)	87(22.8)	169(29.1)	
Age				<0.001
21-25	28(2.9)	18(3.1)	10(2.6)	
26-30	59(6.1)	44(7.6)	15(3.9)	
31-40	430(44.7)	224(38.6)	206(53.9)	
41-50	418(43.4)	269(46.3)	149(39.0)	
51-60	28(2.9)	26(4.5)	2(0.5)	
Literacy Level				0.453
Primary school	23(2.4)	11(1.9)	12(3.1)	
Middle school	303(31.5)	174(29.9)	129(33.8)	
High school	300(31.2)	184(31.7)	116(30.4)	
specialized training school	246(25.5)	154(26.5)	92(24.1)	
Undergraduates and above	91(9.4)	58(10.0)	33(8.6)	
Income per month				0.109 ^a
Below 2000	209(21.7)	131(22.5)	78(20.4)	
2001-4999	635(65.9)	374(64.4)	261(68.3)	
5000-7999	77(8.0)	48(8.3)	29(7.6)	
8000-11999	14(1.5)	8(1.4)	6(1.6)	
12000-20000	10(1.0)	10(1.7)	0(0)	
Above 20000	18(1.9)	10(1.7)	8(2.1)	
Occupation				0.556 ^a
Unemployed/retired	5(0.5)	3(0.5)	2(0.5)	
Service workers	680(70.6)	410(70.6)	270(70.7)	
Laborer or farmer	34(3.5)	20(3.4)	14(3.7)	
Company employee	227(23.6)	139(23.9)	88(23.0)	
Teacher	1(0.1)	0(0)	1(0.3)	
Clinical staff	2(0.2)	0(0)	2(0.5)	
Self-employed	7(0.7)	5(0.9)	2(0.5)	
Students	1(0.1)	0(0)	1(0.3)	
Freelancers	6(0.6)	4(0.7)	2(0.5)	
Whether you have fava bean disease				<0.001
Yes	25(2.6)	5(0.9)	20(5.2)	
No	837(86.9)	496(85.4)	341(89.3)	
Not sure	101(10.5)	80(13.8)	21(5.5)	
Have a family history of fava bean disease				<0.001
Yes	54(5.6)	11(1.9)	43(11.3)	
No	793(82.3)	485(83.5)	308(80.6)	
Uncertain	116(12.0)	85(14.6)	31(8.1)	

Note: P-values for comparisons between different groups were tested using the X2 test or Fisher's exact test.
Significant differences: $P < 0.05^a$ Fisher exact.

Table 2. Participants' knowledge of fava bean disease

Question	Overall Correctness(n/%)	Not willing (n/%) (n=581)	Willing (n/%) (n=382)	P-value
Initial Knowledge of Fava Bean Disease	541(56.2)	224(38.6)	317(83.0)	<0.001
Human-to-human transmission of G6PD disease	632(65.6)	347(59.7)	285(74.6)	<0.001
Genetic characteristics of G6PD	682(70.8)	382(65.7)	300(78.5)	<0.001
Male-female ratio in the incidence of G6PD	189(19.6)	104(17.9)	85(22.3)	0.096
Age of onset of the disease	799(83.0)	455(78.3)	344(90.1)	<0.001
Areas of Incidence of G6P Disease	408(42.4)	227(39.1)	181(47.4)	0.011
Causes of G6PD	515(53.5)	228(39.2)	287(75.1)	<0.001
Drugs that cause G6P	368(38.2)	117(20.1)	251(65.7)	<0.001
Nausea in G6PD	310(32.2)	120(20.7)	190(48.7)	<0.001
Dizziness in G6PD	325(33.7)	134(23.1)	191(50.0)	<0.001
Anemia in G6PD	305(31.7)	108(18.6)	197(51.6)	<0.001
Hemorrhagic symptoms of the onset of G6PD disease	247(25.6)	86(14.8)	161(42.1)	<0.001
Anorexic response to the onset of G6PD disease	259(26.9)	98(16.9)	161(42.1)	<0.001
Screening for fava bean disease provided in Guangxi Province	286(29.7)	92(15.8)	194(50.8)	<0.001
Timing of implementation of screening for fava bean disease in Guangxi Province	114(11.8)	31(5.3)	83(21.7)	<0.001
Institutions responsible for screening for fava bean disease	158(16.4)	35(6.0)	123(32.2)	<0.001

In terms of educational attainment, participants showed a bell-shaped distribution, with the majority of participants having junior and senior high school or college degrees (88.2%), and a relatively small number having lower or higher education (2.9% and 2.9%). More than half of the participants earned less than 5,000 RMB/month (87.6%), suggesting a generally lower socioeconomic background. And only 28 (2.9%) earned more than 12,000. In terms of work occupation, participants were mostly service workers (70.6%), followed by company employees (23.6%), which reflects the employment structure of RT-Mart workers and their families, the main target group of this survey. Only 1 or 2 were teachers (0.1%), clinical staff (0.2%), and students (0.1%).

Among those who were willing or had their children screened for fava bean disease, and those who were not willing to have their children screened for fava bean disease, age ($P<0.001$), whether they had fava bean disease themselves ($P<0.001$), and whether they had a family history of fava bean disease ($P<0.001$) showed statistically significant differences (Table 1). Specifically, middle-aged parents (particularly those aged 41–50) and

parents with prior personal or family experience of fava bean disease were more likely to report willingness to screen.

These findings suggest that socio-demographic variables, particularly middle age and prior disease experience, are closely related to parents' attitudes toward screening. Such patterns are consistent with health behavior theories, such as the Health Belief Model, where perceived susceptibility and perceived benefits influence preventive health behaviors.

Evaluation of knowledge about fava bean disease

In addition to socio-demographic characteristics, knowledge about fava bean disease was also considered a potentially important factor influencing parental willingness to screen their children. To further examine this relationship, participants' understanding of the disease was assessed through a structured set of knowledge questions.

A total of 16 knowledge questions about fava bean disease were set up, including simple questions such as the level of knowledge of fava bean disease, scientific questions such as the

mode of transmission, the affected population and the reaction to the onset of the disease, and inquiries about the news of the screening of fava bean disease in Guangxi province. Sixteen questions could be answered “yes,” “no,” or “don’t know” to explore participants’ knowledge about fava bean disease, and participants were scored 1 point when a question was answered correctly, otherwise no points were awarded. The total score for each participant reflected their level of knowledge about the disease, with higher scores indicating greater knowledge. The least number of participants scoring 0 (0.5%) and the most number of participants scoring 16 (0.9%) was 127 (13.2%), indicating that almost all participants had at least some awareness of the disease. The lowest correct rate was 11.8%, with only 114 participants answering correctly about when screening for fava bean disease was implemented in Guangxi province, and the highest correct rate was 82.0% for the age of high incidence of fava bean disease, followed by 70.8% for the genetic characteristics of fava bean disease, which indicates that participants were more concerned about their children because of their involvement in the upbringing of infants and adolescents.

The percentage of correct responses regarding the incidence of fava bean disease varied less, mostly around 30%, and was lower on the questions about screening organizations and the percentage of men and women with incidence of the disease, both of which were below 20%. There was a significant difference ($P < 0.001$) in the percentage of correct responses to all questions except for the question on the percentage of males and females with the onset of fava bean disease ($P = 0.096$) which was not significantly different from whether they were willing to or had had their children screened for fava bean disease. Additionally, the question on the area of the onset of fava bean disease, which was the second least significant ($P = 0.011$) but was also significant (Table 2). Statistical analysis showed a significant association ($P < 0.001$) between total knowledge scores and screening willingness, suggesting that higher knowledge is linked to increased likelihood of screening participation. This finding aligns with the Health Belief Model, which posits that greater perceived knowledge and susceptibility often motivate preventive health actions. Addressing knowledge deficiencies may therefore be a practical and effective pathway to increasing screening uptake among parents in high-risk regions like Nanning.

Multivariate logistic regression affecting willingness to screen for fava bean disease

The correlation between socio-demographic characteristics, knowledge of fava bean disease, and willingness to or having had their children screened for fava bean disease was assessed by logistic regression. Due to the small number of participants in some of the work occupations, which was only 1 or 2 individuals, it was not statistically significant. The results of the

previous Fisher’s exact test showed that the correlation between the job title and willingness to be screened for fava bean disease was the least significant ($P = 0.556$), so no logistic regression analysis was performed for job occupation.

The results of univariate logistic regression analysis (Table 3) indicated that four factors: age ($P = 0.007$), whether they had fava bean disease ($P = 0.010$), whether they had a family history of fava bean disease ($P < 0.001$), and the score of evaluating the knowledge related to fava bean disease ($P < 0.001$) were significant on the willingness to be screened for fava bean disease (Table 3). These factors were subsequently included in the multivariate logistic regression analysis model.

Ultimately, the results showed that middle-aged adults between the ages of 41 and 50 were more likely to report willingness to have their children screened for fava bean disease (OR = 8.161, 95% CI = 1.632-40.809), compared to those aged 51–60 years. It was also found that, compared to participants who were uncertain of their own G6PD status, participants who had fava bean disease themselves (OR = 2.600, 95% CI = 0.699 -9.670) were more willing to have their children screened for fava bean disease and were willing to have their children screened even when they knew they did not have fava bean disease (OR = 2.295, 95% CI = 1.055-4.995), suggesting that parents were willing to have their children screened if they were aware of the presence of fava bean disease. The same finding was also in the presence or absence of a family history of fava bean disease themselves, with participants with a family history of fava bean disease (OR = 3.742, 95% CI = 1.441-9.714) was associated with increased likelihood of screening willingness. Participants who were more knowledgeable about fava bean disease were also significantly associated with have their children screened (OR = 0.137, 95% CI = 0.100-0.189), reflecting a positive association between knowledge level and screening willingness.

The model passed the Hosmer and Lemeshow test ($X^2 = 8.809$, $df = 8$, $p = 0.359$), indicating a good fit (Table 4). Several odds ratios exhibited wide confidence intervals (e.g., OR = 8.161, 95% CI = 1.632–40.809), suggesting potential instability in the model estimates, possibly due to small subgroup sizes or variable sparsity. These limitations are further discussed in the Discussion section.

The relatively low screening willingness observed in this study may be partially explained by factors such as limited disease knowledge, financial concerns, and perceived inconvenience.

Discussion and Conclusion

In the present study, the percentage of parents willing to screen their children for fava bean disease was 39.7%, which is relatively low. Compared with other related studies, for example, where parental willingness to screen may be more than 50% or even higher in some studies targeting screening for specific

Table 3. Univariate logistic regression analysis of factors influencing the willingness to have children screened for fava bean disease

Factors of Influence	OR (95%CI)	P-value
Gender		
female	Reference	0.163
male	1.040(0.707-1.530)	
Age		
21-25	Reference	0.007
26-30	7.151(1.107-46.174)	
31-40	5.678(0.981-32.867)	
41-50	14.615(2.841-75.192)	
51-60	7.547(1.475-38.609)	
Literacy Level		
Primary school	Reference	0.104
Middle school	2.837(0.861-9.345)	
High school	1.785(0.934-3.413)	
specialized training school	1.425(0.757-2.683)	
Undergraduates or above	1.114(0.605-2.048)	
Income per month		
Below 2000	Reference	0.542
2001-4999	0.778(0.227-2.666)	
5000-7999	0.735(0.223-2.425)	
8000-11999	0.707(0.194-2.576)	
12000-20000	1.390(0.238-8.140)	
Above 20000	0.745(0.224-2.512)	
Whether you have fava bean disease		
Yes	Reference	0.010
No	2.927(0.732-11.708)	
Not sure	2.158(0.959-4.855)	
	Reference	
Have a family history of fava bean disease		
Yes	3.958(1.482-10.572)	<0.001
No	0.793(0.390-1.613)	
Uncertain	Reference	
	Reference	
Total score for evaluating knowledge related to fava bean disease		
5 or below	Reference	<0.001
6 or above	0.137(0.100-0.189)	

Table 4. Multifactorial logistic regression analysis of factors influencing children’s willingness to be screened for fava bean disease

Factors of influence	OR (95%CI)	P-value
Age		0.039
21-25	6.804(1.098 – 42.161)	
26-30	5.251(0.938 – 29.407)	
31-40	5.251(0.938 – 29.407)	
41-50	8.161(1.632 – 40.809)	
51-60	Reference	
Whether you have fava bean disease		0.036
Yes	2.600(0.699 – 9.670)	
No	2.295(1.055 – 4.995)	
Not sure	Reference	
Have a family history of fava bean disease		0.007
Yes	3.742(1.441 – 9.714)	
No	0.790(0.397 – 1.569)	
Uncertain	Reference	
Total score for evaluating knowledge related to fava bean disease		<0.001
5 or below	Reference	
6 or above	6.746(4.959-9.179)	

genetic disorders, the lower willingness to screen in the present study may be related to the lack of parental knowledge about fava bean disease and the lack of awareness of the importance of screening. This suggests the need to further increase screening participation through increased public education and disease awareness.

Based on the data given, initiatives of promoting education based on genetic diseases are recommended. As what we know from now, participants who were more knowledgeable about fava bean disease were more likely to report willingness to have their children screened (OR = 0.137, 95% CI = 0.100-0.189). The understanding and acknowledgement of fava bean disease do play a part in the decision making of parents.

Almost every elementary school has health lessons to guide young children on disease prevention, basic knowledges about diseases, and maintenance of sanitary. So, one of the most feasible and less costly solution can be incorporating information and teachings about fava bean disease in the school health classes syllabus⁶. This can include information of what is G6PD deficiency, consequences of G6PD deficiency exposure, and encouragement for people to take screening tests of G6PD deficiency. Many of those teachings might associate with basic studies of subjects (for example, biology), inspiring young children's academic interest.

Taking young children's cognitive ability into consideration, those teachings will only provide rudimentary and basic and practical knowledge rather than theoretical ones.

Through the previous multifactorial analysis, it is easy to see that middle-aged adults (41 to 50 years old) were more likely to express willingness to screen their children for fava bean disease, probably because they become more health-conscious as they grow older, have a greater awareness of their family responsibilities, and have more life experience that makes them pay more attention to preventive health measures. Respondents who had fava bean disease themselves, or a family history of it, also showed greater reported willingness, which may be due to heightened risk perception and emotional connection to the condition. Participants with more knowledge about fava bean disease, on the other hand, were able to recognize the importance of screening due to their higher level of knowledge and thus were more willing to participate. These factors suggest that health education, customized health messaging for different populations, and the provision of genetic counseling and personalized screening recommendations are critical to increasing public awareness and participation in G6PD deficiency screening. By taking into account an individual's sociodemographic characteristics, health status, and knowledge, more effective screening promotion programs can be designed to reduce the impact of G6PD deficiency on children's health.

In this study, the main reasons for parents' reluctance to have their children screened for fava bean disease included: first, lack of knowledge about the disease and its severity, which led to

insufficient awareness of the importance of screening; second, concern about the cost of screening, especially among families with limited financial resources or parents who were unaware of health insurance coverage; third, insufficient accessibility to screening services, such as long distance from the point of service or long waiting time, which affecting parents' willingness to bring their children to participate in screening; and fourth, parents' own health experiences and lack of trust in the health care system, which can also affect their attitudes toward screening. Together, these factors contribute to some parents' reservations about screening, suggesting the need to increase acceptance by reducing screening costs, optimizing service accessibility, and strengthening health education and promotion.

This study has several limitations that should be acknowledged. First, the sample consisted exclusively of RT-Mart employees and their families, a group that may share similar work environments, educational backgrounds, or socioeconomic status. This potentially limits the generalizability of the findings to the broader population. Second, the logistic regression model produced some odds ratios with wide confidence intervals, indicating potential instability in the model estimates. This may be due to small subgroup sizes or low outcome frequencies in certain categories. Third, the questionnaire was not subjected to pretesting or formal reliability assessments, which may affect the robustness of the measurement tools used to assess knowledge and attitudes. Future research could consider broader and more diverse populations to improve generalizability. In addition, longitudinal or interventional studies may help clarify causal pathways between knowledge, attitudes, and screening behavior. Exploring other psychological or social factors may also provide a more comprehensive understanding of screening decisions.

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