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ORIGINAL ARTICLE

Observational Study

Assessment of knowledge, cultural beliefs, and behavior regarding medication safety among residents in Harbin, China

Xuan-Tong Liu, Na Wang, Li-Qiu Zhu, Yu-Bo Wu

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Abstract

BACKGROUND

Medication misuse or overuse is significantly associated with poor health outcomes. Information regarding the knowledge, cultural beliefs, and behavior about medication safety in the general population is important.

AIM

To conduct a survey on medication habits and explored the potential factors impacting medication safety.

METHODS

The current survey included adults from 18 districts and counties in Harbin, China. A questionnaire on medication safety was designed based on knowledge, cultural beliefs, and behavior. Both univariate and multivariate analyses were used to explore the factors that impacted medication safety.

RESULTS

A total of 394 respondents completed the questionnaires on medication safety. The mean scores for knowledge, cultural beliefs, and behavior about medication safety were 59.41 ± 19.33, 40.66 ± 9.24, and 60.97 ± 13.69, respectively. The medication knowledge score was affected by age (P = 0.044), education (P < 0.001), and working status (P = 0.015). Moreover, the cultural beliefs score was significantly affected by education (P < 0.001). Finally, education (P = 0.003) and working status (P = 0.011) significantly affected the behavior score.

CONCLUSION

The knowledge, cultural beliefs, and behavior about medication safety among the general population was moderate. Health education should be provisioned for the elderly, individuals with a low education level, and the unemployed to improve medication safety in Harbin, China.

Key Words: Knowledge; Cultural beliefs; Behavior; Medication safety; Cross-sectional study

Core Tip: Despite its importance, little work has been done to understand the knowledge, cultural beliefs, and behavior around medication safety among the public. To conduct a survey on medication habits and explored the potential factors impacting medication safety. This study described the knowledge, cultural beliefs, and behavior around medication safety in the general population of Harbin, China, and identified factors that impact these aspects.

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INTRODUCTION

Inappropriate medication use and adverse drug events can cause adverse health outcomes. Thus the provision of safe medications is a priority for health care[1]. Medication safety and pharmacovigilance are essential for healthcare systems to ensure patient safety. It has been demonstrated that medication safety is significantly related to preventable hospitalization and increased economic burden[2]. The medication treatment process includes the doctor's prescription, pharmacist's check-ups, and administration to the patient; medication safety is important at all three stages.

Medication-related problems have become an important cause of patient injury in China. The Global Burden of Disease Study indicated that drug abuse was China's 18th most common reason for disability-adjusted life years in China[3]. Moreover, the incidence of drug-induced liver injury in China was 23.90 per 100000 people annually, as reported in 2019, which was higher than that in Western countries[4]. Furthermore, medication-derived acute kidney injuries (AKIs) account for 37.50% of hospital-acquired AKIs[5]. Given that the high incidence of medication-related problems is significantly associated with increased risks of morbidity and mortality and that the coronavirus disease 2019 pandemic has already disrupted the daily work of clinicians, the general population needs to be attentive to medication safety [6-10].

A prior study found that only 49.47% of the respondents answered correctly about antibiotic use and drug resistance, and 19.96% answered that they did not know how to use their medicines[11]. These results suggest that popular science books and public lectures on medication should be introduced for local residents. Currently, self-administrated, over-the-counter (OTC) medications are used for disease symptoms identified through self-diagnosis, by choice, and for medical use[12,13]. Moreover, high literacy rates in elderly populations provide the best conditions for the use of OTC medications[14]. They are associated with a lower economic burden and are fully accessible at pharmacies[15,16]. However, the wide use of OTC medications could cause more medication safety events[12,15]. Considering that poor medication safety in the general population is related to a lack of medication knowledge, poor safety awareness, and incorrect medication behavior, this study investigated the knowledge, cultural beliefs, behavior, and factors impacting those aspects of medication safety in the general population of Harbin, China.

MATERIALS AND METHODS

Study design and setting

This cross-sectional study included 552 Chinese citizens aged > 18.0 years from 18 districts and counties in Harbin, China, between April and June 2021. This study was approved by the ethics committee of the Fourth Hospital of Harbin Medical University. An approaching sampling approach was adopted, and the adult residents of Harbin were the survey objects. The sample size in our study was calculated using the following formula: $n\ (\text{required sample size}) = \frac{(\frac{Z_{\alpha/2} \times \text{variance}}{\delta})^2 \times \text{N}}{\text{N} + (\frac{Z_{\alpha/2} \times \text{variance}}{\delta})^2}$, N: Total population in Harbin (10009854); δ

(allowable error): 0.20; variance: 1.58; $Z_{\alpha/2}$: 1.96. This indicated that at least 240 individuals should be recruited. The questionnaire was distributed using both online and offline methods. The online questionnaire relied on the WeChat application, and the Wenjuanxing platform was the data collection carrier. To eliminate responses from those who did not fill in the answers carefully, online responses to back-end statistics completed in less than 180 s were eliminated from the analysis. Subsequently, an objective test was conducted based on the same questions, and those with inconsistent answers to these questions were also eliminated.

The offline survey was carried out as follows: The investigator issued the questionnaire and allowed the respondents to complete it independently, after which the investigator captured the data onto a database. This all took place on-site. Elderly adults completed the paper questionnaire with the help of the investigators. Data from the offline survey were entered in Epi Info (CDC, Atlanta, Georgia, United States). Investigators were trained at a community health service center, and experiences were shared to assist in dealing with problems that may arise during the investigation process. In the end, 394 questionnaires were used for further analyses.

Questionnaire design

The questionnaire was developed based on the knowledge, cultural beliefs, behavior, and medication safety items in the Science and Technology Development Center of the Chinese Pharmaceutical Association (Supplementary material)[17]. The reliability of the questionnaire was assessed; Cronbach's α was 0.883[18]. It contained questions regarding gender, age, income, medical insurance, education level, working status, occupation, drug and medication knowledge, cultural beliefs toward the exposure to and treatment of medication knowledge *via* lectures or education, and behaviors related to the medication process. A six-level score system was applied for each question in the questionnaire, which was quantified using the Likert Scale, and scored as follows: (1) Strongly disagree; (2) Disagree; (3) General; (4) Agree; (5) Strongly agree; and (6) Unclear. High scores in each item indicated patients at high risk. The knowledge domain included 27 questions, and the scoring system ranged from 27 to 162; a score of 27-54 was defined as excellent, 55-82 as good, and > 82 as to be improved. The cultural beliefs domain included 11 questions, and the scoring system ranged from 11 to 66; a score of 11-22 was defined as excellent, 23-33 as good, and > 33 as to be improved. The behavior domain included 24 questions, and the scoring system ranged from 24 to 144; a score of 24-48 was defined as excellent, 49-72 as good, and > 72 as to be improved.

Statistical analysis

The knowledge, cultural beliefs, and behavior scores were presented as means ± SD, and the scores according to individuals' characteristics were compared using independent *t*-tests or one-way ANOVA. The Bonferroni method was applied to assess differences between groups where the one-way ANOVA indicated significant differences. Categorical variables were presented as frequencies and proportions. Multivariate linear regression was applied to explore the impact factors of knowledge, cultural beliefs, and behavior. Variable screening was performed using the step-by-step entry method, and the regression coefficient of the multivariate linear regression model was used to estimate the parameters (α = 0.05, β = 0.10). All reported *P* values were two-sided, and the inspection level was 0.05. All statistical analyses were conducted using IBM SPSS Statistics for Windows, version 26.0 (SPSS 26.0).

RESULTS

Knowledge, cultural beliefs, and behavior scores for medication risk in Harbin residents

The total score for knowledge, cultural beliefs, and behavior was 161.23 ± 33.05, and the mean scores for knowledge, cultural beliefs, and behavior were 59.41 ± 19.33, 40.66 ± 9.24, and 60.97 ± 13.69, respectively (Table 1). The scoring rate was defined as mean score/total score and was considered high at < 20%, medium at 20%-49%, and low at > 50%. The scoring rates for medication knowledge, cultural beliefs, and behavior were 36.67%, 61.61%, and 42.34%, respectively. Therefore, the medication knowledge and behavior scoring rates were medium and for cultural beliefs it was low. We noted that the scoring rate for knowledge of antibacterial drugs was the lowest (35.75%), and that of drug stores was the highest (39.25%). Moreover, the scoring rate for medication purchase behavior (59.39%) and expired medication management (54.89%) were both low in the behavior domain.

Knowledge, cultural beliefs, and behavior scores according to demographic characteristics

The knowledge, cultural beliefs, and behavior scores of medication risk according to demographic characteristics are shown in Table 2. We noted significant differences in knowledge scores when stratified by age ($P < 0.001$), income ($P = 0.035$), education level ($P < 0.001$), working status ($P < 0.001$), and occupation ($P = 0.043$). Moreover, the cultural beliefs scores were statistically significant when stratified by medical insurance ($P = 0.007$), education level ($P = 0.002$), working status ($P = 0.047$), and occupation ($P = 0.041$). Finally, the behavior scores differed significantly when stratified by age ($P =$

Table 1 The scores for each dimensions in KAP model

Domain	Total level/factor	Number of items	Range	mean ± SD	Scoring rate, %
Knowledge	Medicine tips	13	13-78	28.08 ± 9.70	35.9
	Antibacterial drugs	6	6-36	12.87 ± 5.56	35.75
	Drug withdrawal	4	4-24	9.22 ± 3.69	38.42
	Drug store	2	2-12	4.71 ± 1.99	39.25
	Drug selection	2	2-12	4.54 ± 1.98	37.83
	Total scores	27	27-162	59.41 ± 19.33	36.67
Cultural beliefs	Cultural beliefs 1	6	6-36	26.90 ± 5.57	74.72
	Cultural beliefs 2	5	5-30	13.76 ± 6.22	45.87
	Total scores	11	14-66	40.66 ± 9.24	61.61
Behavior	Premeditation behavior	8	9-48	22.24 ± 6.24	46.33
	Behavior in medication	3	3-18	4.91 ± 2.48	27.28
	Medication compliance	6	6-36	11.31 ± 4.50	31.42
	Medication storage behavior	3	3-18	8.53 ± 3.11	47.39
	Medication purchasing behavior	3	4-18	10.69 ± 2.33	59.39
	Expired medication management	1	1-6	3.29 ± 1.52	54.83
	Total scores	24	35-144	60.97 ± 13.69	42.34

0.049), education level (P = 0.024), and working status (P = 0.007).

Impact factors on knowledge, cultural beliefs, and behavior scores

Table 3 presents the results of the multivariate linear regression of knowledge, cultural beliefs, and behavior scores. We noted that knowledge scores could be affected by age (P = 0.044), education level (P < 0.001), and working status (P = 0.015) but not by salary (P = 0.317) and occupation (P = 0.411). Moreover, the cultural beliefs score was affected by education level (P < 0.001) but not by medical insurance (P = 0.153) and working status (P = 0.514) after adjusting potential confounders. Finally, education level (P = 0.003) and working status (P = 0.011) were significantly associated with the behavior score, while age was not (P = 0.054).

DISCUSSION

This cross-sectional study aimed to assess the knowledge, cultural beliefs, and behavior around medication safety in the general population of Harbin, China. We noted that the knowledge, cultural beliefs, and behavior for medication safety in the general population were relatively good. Moreover, we noted that increased age could affect medication safety knowledge, education level could affect knowledge, cultural beliefs, and behavior scores, and working status could affect knowledge and behavior scores.

Several studies have addressed people's knowledge, attitude, and behavior around medication safety [19-21]. One cross-sectional study included healthcare practitioners from a tertiary care setting in Saudi Arabia and found that their staff had sufficient knowledge regarding medication error reporting. However, medication errors are generally under-reported in practice[19]. Al-Mutairi *et al*[20] suggested that educational programs should be applied to improve adverse drug reaction reporting rates after reporting positive attitudes and satisfactory practices relating to medication safety knowledge, attitude, and behavior among hospital pharmacists. Lee *et al*[21] surveyed the knowledge, attitude, and behavior of elderly Korean adults and found that knowledge regarding medication use was positively related to their attitudes and practices. However, no study to date has focused on the knowledge, cultural beliefs, and behavior of the general population in China. Therefore, the current study was carried out to describe these aspects and the factors affecting them in the general population.

Our study found that the knowledge, cultural beliefs, and behavior scores for medication safety in the general population were 59.41, 40.66, and 60.97, respectively, and the total score was 161.23. For the knowledge domain category, we noted that understanding related to the application of antibacterial drugs was relatively acceptable, and the level of rational knowledge of drug stores needed to be strengthened. However, we noted that behaviors related to purchasing medication and management of

Table 2 The knowledge, cultural beliefs, and behavior scores of medication risk according to demographic characteristics

Variable	Number	Knowledge			Cultural beliefs			Behavior		
		Scores	*t*/*F* value	*P* value	Scores	*t*/*F* value	*P* value	Scores	*t*/*F* value	*P* value
Gender										
Male	116	57.38 ± 17.26	-1.349	0.178	41.74 ± 9.35	1.262	0.208	60.19 ± 11.10	-0.73	0.466
Female	278	60.26 ± 20.10			40.47 ± 9.00			61.29 ± 14.64		
Age (yr)										
19-34	135	54.52 ± 22.70	8.047	< 0.001	40.81 ± 9.71	0.03	0.993	62.47 ± 15.95	2.644	0.049
35-49	158	58.97 ± 16.45			40.89 ± 9.14			59.69 ± 11.96		
50-64	67	66.24 ± 18.03			40.64 ± 9.02			58.84 ± 12.94		
Over 65	34	67.41 ± 12.68			41.21 ± 6.79			65.18 ± 11.80		
Salary (RMB)										
< 1000	19	54.95 ± 11.91	2.606	0.035	42.53 ± 8.93	0.776	0.542	63.47 ± 10.41	0.654	0.624
1000-2000	50	64.12 ± 22.38			42.22 ± 9.11			60.94 ± 13.61		
2000-4000	158	61.63 ± 20.31			40.68 ± 9.32			61.71 ± 14.67		
4000-6000	93	56.94 ± 18.78			40.99 ± 9.38			60.77 ± 15.10		
> 6000	74	55.74 ± 16.01			39.66 ± 8.38			59.01 ± 10.06		
Medical insurance										
Social basic	309	58.54 ± 18.74	2.021	0.091	40.34 ± 9.08	3.544	0.007	60.58 ± 13.54	0.996	0.409
Commercial	14	66.86 ± 14.60			43.29 ± 7.43			62.14 ± 10.90		
Self-funded	23	56.87 ± 13.67			44.30 ± 8.86			66.13 ± 13.89		
Free	16	58.38 ± 15.49			36.44 ± 6.68			59.06 ± 9.13		
Others	32	66.94 ± 28.50			44.38 ± 9.83			61.50 ± 17.40		
Education level										
Postgraduates	22	48.00 ± 18.84	11.661	< 0.001	36.82 ± 9.61	3.804	0.002	56.64 ± 9.33	2.628	0.024
Undergraduates	141	53.35 ± 13.39			39.19 ± 9.39			59.20 ± 11.32		
College students	125	60.82 ± 19.13			41.30 ± 8.76			61.78 ± 16.32		
Secondary or senior high	62	64.31 ± 18.70			42.89 ± 9.33			61.02 ± 13.69		

Junior high school	41	74.56 ± 26.50			43.68 ± 7.04			65.95 ± 13.23		
Primary school	3	61.00 ± 12.77			48.33 ± 1.53			73.33 ± 2.31		
Working status										
On-the-job	285	56.58 ± 19.07	12.137	< 0.001	40.45 ± 9.43	3.072	0.047	59.86 ± 13.59	5.027	0.007
Retired	63	65.35 ± 14.05			40.35 ± 7.89			61.90 ± 13.09		
Unemployed	46	68.83 ± 22.47			43.96 ± 8.20			66.57 ± 13.92		
Occupation										
Enterprise workers	58	60.86 ± 16.57	2.025	0.043	59.41 ± 19.33	2.038	0.041	60.45 ± 11.54	1.242	0.273
Company employees	76	56.25 ± 17.60			41.67 ± 10.58			61.41 ± 13.23		
Cadres	25	60.52 ± 16.95			41.53 ± 8.07			58.84 ± 9.86		
Medical institution	98	55.01 ± 18.81			39.20 ± 7.83			58.27 ± 12.49		
Teachers	8	61.50 ± 18.68			38.52 ± 9.58			60.88 ± 6.69		
Enterprise management	15	68.93 ± 23.21			37.75 ± 7.78			63.87 ± 24.99		
Freelanced	47	64.57 ± 21.90			39.40 ± 8.98			64.00 ± 10.95		
Students	11	64.55 ± 30.39			41.98 ± 7.55			66.64 ± 25.47		
Others	56	60.86 ± 16.57			40.64 ± 12.67			62.18 ± 15.12		

expired medication were poor. There could be several reasons for this. Harbin residents do not frequently participate in lectures or educational activities on medication knowledge, and only 40.03% of the respondents supported the idea that these educational activities should be carried out in various ways. The low participation rate may be because such activities do not attract all audiences; young people prefer internet-based science education, and the elderly prefer one-on-one learning within their communities. In addition, the sick and the healthy have different concerns regarding medications, and media coverage of this is very limited. Unfortunately, certain healthcare companies have deceived the public in the name of "health lectures" and "free physical examinations". This has affected the public's enthusiasm and willingness to participate in knowledge-seeking educational activities on medication carried out by hospitals and pharmacists.

Our study found that the elderly had less knowledge of medication safety. This may be because the elderly use more medication than any other group. Physically, the elderly are in a degraded state of function, and multiple integrated diseases are more common among them. Therefore, there are more varieties of medications for the elderly, which are associated with an increased risk of medication error [21]. Moreover, knowledge, cultural beliefs, and behavior scores were significantly related to education levels. In our study, the literacy rate among the 3 (0.76%) individuals with a primary school level education was 100%, which was higher than the literacy rate in the elderly population. Low education levels are significantly related to low medication knowledge levels, leading to an increased risk of

Table 3 Multivariate linear regression of knowledge, cultural beliefs, and behavior scores

Domain	Factors	Non-standardized coefficients		Standardized coefficients	*t*	*P* value	95.0% confidence interval for B	
		B	SE	Beta			LL	UL
Knowledge	Constant	30.764	5.402	-	5.695	< 0.001	20.143	41.385
	Age	2.242	1.109	0.108	2.022	0.044	0.062	4.422
	Salary	0.947	0.946	0.053	1.002	0.317	-0.912	2.807
	Education	4.926	0.948	0.281	5.196	< 0.001	3.062	6.79
	Working status	3.775	1.542	0.134	2.447	0.015	0.742	6.807
	Occupation	0.3	0.365	0.042	0.823	0.411	-0.417	1.017
Cultural beliefs	Constant	34.41	1.51	-	22.795	< 0.001	31.442	37.378
	Medical insurance	0.524	0.366	0.072	1.432	0.153	-0.195	1.244
	Education	1.585	0.427	0.192	3.711	< 0.001	0.745	2.424
	Working status	0.466	0.713	0.035	0.653	0.514	-0.935	1.866
Behavior	Constant	54.513	2.23	-	24.44	< 0.001	50.128	58.898
	Age	-1.53	0.793	-0.104	-1.929	0.054	-3.09	0.029
	Education	1.988	0.674	0.16	2.948	0.003	0.662	3.313
	Working status	2.666	1.042	0.134	2.558	0.011	0.617	4.716

LL: Low level; UL: Upper level.

medication error. People with low education levels develop their knowledge of medication use through experience and intuition, and their awareness of the risks associated with medication error is insufficient[22]. Comparatively, highly educated people have a greater desire for knowledge of medication safety, and medication guidance is sought to understand safety issues better[23]. Furthermore, knowledge and behavior scores could be affected by work status; unemployment was linked with high scores for the risks associated with medication safety. A reason for this could be that the unemployed are less aware of the importance of obtaining knowledge on medication safety. Therefore, to improve residents' literacy on medication safety, the elderly, less educated, and unemployed should seek rational knowledge of medications and enhance their awareness of medication safety. Therefore, some interventions should be applied to improve medication safety, including: (1) Outpatient pharmacy services and drug consultation offices should be provided for patients (especially high-risk patients) to improve medication safety; (2) Health education should be introduced for medication used according to the patients' characteristics and should encompass both an online and offline approach; and (3) Medication follow-up visits and management should be monitored by an online platform, like WeChat official.

Several limitations of the current study should be acknowledged. First, this study was cross-sectional, and the causalities associated with the impact factors of knowledge, cultural beliefs, and behavior could not be obtained. Second, the survey was conducted using both online and offline methods, and the quality of the completed questionnaires differed between the two, which could induce uncontrolled information bias. Third, some of the questionnaires completed online within 180 s were ruled out, and this potential selection bias could affect the analysis outcomes. Finally, we recruited individuals from 18 districts using an approaching sampling approach, and the difference in districts might affect knowledge, cultural beliefs, and behavior.

CONCLUSION

This study found that the knowledge, cultural beliefs, and behavior associated with medication safety in the general population of Harbin, China was moderate, and the main factors impacting them included age, education level, and working status. Therefore, health education should be applied to improve medication safety for the elderly, individuals with low levels of education, and the unemployed.

ARTICLE HIGHLIGHTS

Research background

The Global Burden of Disease Study indicated that drug abuse was China's 18th most common reason for disability-adjusted life years. Moreover, the incidence of drug-induced liver injury in China was 23.90 per 100000 people annually, as reported in 2019, which was higher than that in Western countries. The high incidence of medication errors and adverse events is significantly associated with an increased risk of morbidity, mortality, prolonged hospitalization, and increased economic burden.

Research motivation

The knowledge, cultural beliefs, and behavior around medication safety in the general population are important, and no study to date has focused on the general population in China.

Research objectives

The knowledge, cultural beliefs, and behavior regarding medication safety were described, and factors potentially impacting those aspects were explored.

Research methods

This cross-sectional survey recruited from 18 districts and counties in Harbin, China. The knowledge, cultural beliefs, and behavior for medication safety were obtained from a questionnaire. Both univariate and multivariate analyses were used to explore the factors that impacted medication safety.

Research results

The mean scores for knowledge, cultural beliefs, and behavior were 59.41, 40.66, and 60.97, respectively. The medication knowledge score was affected by age ($P = 0.044$), education ($P < 0.001$), and working status ($P = 0.015$); the cultural beliefs score was significantly affected by education ($P < 0.001$); working status ($P = 0.011$) and education ($P = 0.003$) were significantly associated with behavior score.

Research conclusions

Knowledge, cultural beliefs, and behavior about medication safety in the general population were moderate, and the main impact factors were age, education, and working status.

Research perspectives

The elderly, individuals with a low education level, and the unemployed should receive further health education to ensure the safe use of medications in Harbin, China.

FOOTNOTES

Author contributions: Liu XT conceived and designed the experiments; Liu XT, Wang N, Zhu LQ, and Wu YB performed the experiments; Liu XT and Wang N analyzed the data and wrote the paper; Liu XT contributed reagents/materials/analysis tools; and all author shave read and approved the final version of this manuscript.

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Institutional review board statement: This study was approved by the ethics committee of the Fourth Hospital of Harbin Medical University.

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