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Original article

Factors associated with the use of over-the-counter sleep aids containing diphenhydramine: A cross-sectional study in Saudi Arabia

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ABSTRACT

Introduction: Diphenhydramine, either alone or in combination with pain relievers, is one of the widely used over-the-counter sleep aids. However, few studies have evaluated the use of diphenhydramine-containing products, such as Panadol Night, in Saudi Arabia. Therefore, the objectives of this study were to assess the prevalence of Panadol Night use and to identify factors associated with its use in the Eastern Province of Saudi Arabia.

Methods: A cross-sectional study was conducted among adults aged 18 years or older in the Eastern Province of Saudi Arabia. Data were collected through an online self-administered questionnaire from 05 March 2022 to 20 March 2022. Chi-square tests and multivariable logistic regression models were used to examine the associations between Panadol Night use in the past month and independent variables.

Results: A total of 1244 adults participated in the survey. Approximately, 42.3% reported that they have used Panadol Night in their lifetime; 12.1% used Panadol Night in the past month. The majority of the Panadol Night users (62.4%) reported that their use was based on their family/friends' recommendations, while 23.6% used Panadol Night based on healthcare providers' recommendations. The multivariable logistic regression models showed that gender, health related fields, perceived safety and effectiveness of Panadol Night, a history of insomnia, trouble sleeping due to pain, and sleep quality were significantly associated with the use of Panadol Night in the past month.

Conclusions: Our findings indicated that adults' perceptions of the effectiveness and safety of Panadol Night were significantly associated with its use. Also, adults in non-health related fields were more likely to use Panadol Night compared to those in health related fields. This suggests the need for raising awareness about the appropriate use of Panadol Night. Community pharmacists can play an essential role in educating patients during the time of purchase.

1. Introduction

Sleep disorders are a common public health problem affecting adults worldwide with a prevalence varying from 1.6% to 56.0% (Koyanagi and Stickley, 2015; Léger et al., 2008; Stranges et al., 2012). One of the most common sleep disorders is insomnia. The prevalence of insomnia was estimated to be as high as 77.7% in the general population in Saudi Arabia (Ahmed et al., 2017). Insomnia and other sleep disorders can negatively impact daily activities, productivity, and overall quality of life (Centers for Disease Control and Prevention, 2011; Hinz et al., 2017; Hui and Grandner, 2015). To treat these disorders and avoid their negative consequences, sleep aid medications can be used. Some of these medications require prescription such as benzodiazepines and non-benzodiazepine hypnotics (i.e., "Z-drugs"–zolpidem, zopiclone, zaleplon), while others are available over-the-counter (OTC) (Maust et al., 2019). One of the most widely used OTC sleep aids is diphenhydramine (Culpepper and Wingertzahn, 2015). Diphenhydramine, a first-generation antihistamine with sedative and anticholinergic properties, works by blocking the effects of histamine and causing drowsiness (Church and Church, 2013). Due to its sedative properties, diphenhydramine has been used to treat sleep problems (Culpepper and Wingertzahn, 2015).

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Diphenhydramine is not only used alone but also in combination with other medications such as pain relievers. The prevalence of using sleep aids containing diphenhydramine has been measured in different countries. In the United States (US), 58.6% of adults have used sleep aids containing diphenhydramine in their lifetime (Abraham et al., 2017). Among adults taking diphenhydramine or doxylamine products in the US, 21.0% of young adults, 37.0% of those aged 65–74, and 47.0% of those aged 75 and older reported long-term use in the past month (Albert et al., 2017). A recent study has surveyed 414 adults in Saudi Arabia and revealed that 87.2% used sleep aids containing diphenhydramine in the past and 31.9% were current users (Alhwimani et al., 2021). The frequent use of these products could result in inappropriate use and negative health consequences (Nam et al., 2016). For example, long-term use of diphenhydramine-containing products is considered inappropriate and is associated with adverse effects such as orthostatic hypotension, fall risk, and dementia (Gray et al., 2015; Panel et al., 2019; Wolfson et al., 2022).

With that being said, it is important to understand the characteristics of Panadol Night users. Currently, few studies have evaluated the use of sleep aids containing diphenhydramine in Saudi Arabia. Panadol Night, a combination of 25 mg of diphenhydramine hydrochloride and 500 mg of paracetamol, is one of the common OTC sleep aids in Saudi Arabia (Aljohani and Aldughaither, 2019). To our knowledge, factors associated with Panadol Night use have not been investigated yet. Therefore, the objectives of the current study were to assess the prevalence of Panadol Night use and to identify factors associated with its use in the Eastern Province of Saudi Arabia.

2. Material and Methods

2.1. Study design and procedure

This was a cross-sectional study using an anonymous, self-administered online survey. Prior to the initiation of this study, our protocol (KFU-REC-2022-FEB-EA000442) was approved by the Research Ethics Committee at King Faisal University, Saudi Arabia. Cognitive interviewing was conducted in a purposive sample of adults, representing a diversity of ages, genders, and education levels (n = 10). During these interviews, we asked the participants for feedback on the survey's clarity to ensure they understood the instructions and all questions. Responses gathered from the cognitive interviews were used to finalize the survey, but not included in the final analysis. After finalizing the survey, the online survey was sent to those who participated in the cognitive interviews to be included in the study sample. The final survey was converted into Google Forms and distributed from 05 March 2022 to 20 March 2022.

2.2. Study participants

Eligible study participants were adults who aged 18 years or older, resided in the Eastern Province of Saudi Arabia, and were able to read and write in Arabic. To ensure that all responses were collected from the Eastern Province of Saudi Arabia, we started the survey with the following question: "Do you live in the Eastern region?" If the participant answered "No," that ended the survey. Those who answered "Yes" were asked in which city they live. We excluded participants who stated cities outside the Eastern Province. The participants in this study were recruited using a convenience sampling technique through social media platforms (e.g., Twitter) and university list-serve emails.

2.3. Measures

2.3.1. Dependent variable

2.3.1.1. Panadol Night use. Panadol Night use was measured by asking three questions; each question has a specified time. First, participants were asked if they ever used Panadol Night to help them fall asleep. Second, they were asked if they used Panadol Night to help them fall asleep in the past month. Finally, the current use of Panadol Night was assessed by asking "Do you currently use Panadol Night to help you fall asleep?"

2.3.2. Independent variables

2.3.2.1. Participant characteristics. The demographic data collected included age, gender, education, marital status, area of residence, employment status, and whether participants were studying or working in health related fields.

2.3.2.2. Knowledge about OTC sleep aids. Participants' knowledge about OTC sleep aids was measured by asking "Which of the following OTC sleep aids are you aware of?" and five medications were listed "Panadol Night, valerian, melatonin, St. John wort, and Histop". These medications were selected because they are common in Saudi Arabia.

2.3.2.3. Panadol Night variables. Knowledge about the right indications for Panadol Night was assessed. Perceived safety of Panadol Night was measured using a single item (i.e., it is safe to use Panadol Night), where participants responded on a rating scale ranging from 1 strongly disagree to 5 = strongly agree. The perceived effectiveness of Panadol Night in treating insomnia was assessed by asking "Do you think you can treat chronic insomnia with Panadol Night successfully?" Additional questions were asked to those who answered "yes" to one of the Panadol Night use variables (i.e., "ever-use", "past use", or "current use"); those participants were asked if their selection of Panadol Night was based on a recommendation from a doctor, pharmacist, nurse, family member or friend, internet, or self-use. They were also asked if they experienced any adverse reactions due to Panadol Night, and how they dealt with those adverse reactions if occurred.

2.3.2.4. Sleep problem variables. Participants were asked if they have ever been diagnosed with insomnia. Two questions were adopted from Pittsburgh Sleep Quality Index (PSQI) to assess sleep problems and sleep quality during the past month (Buysse et al., 1989). For example, participants were asked, "During the past month, how often have you had trouble sleeping because you have pain?"

2.3.2.5. Perceived health status. Health status was assessed by asking two questions. The first question regarding general health was adopted from the SF-36 health survey (i.e., "In general, would you say your health is: 1. Poor; 2. Fair; 3. Good; 4. Very good; 5. Excellent") (Ware Jr and Sherbourne, 1992). The second question was about mental health and was adopted from the patient-reported outcomes measurement information system (PROMIS) Short Form Global Health Scale (Barile et al., 2013). Participants were asked, "In general, how would you rate your mental health, including your mood and your ability to think?" The response scale ranged from 1 = poor to 5 = excellent.

2.4. Statistical analyses

Descriptive statistics were used to summarize the participants' characteristics. Chi-square tests were used to examine the unadjusted associations between Panadol Night use in the past month and independent variables. Adjusted multivariable logistic regres-

sion models were performed to examine the associations between Panadol Night use in the past month and independent variables. Among the Panadol Night use variables, Panadol Night use in the past month was selected as the model outcome because it has the same time interval of assessment as sleep problem variables. Sleep problem variables were only measured in the past month. The other independent variables included in the logistic regression models were demographics, knowledge about OTC sleep aids, perceived safety of Panadol Night, perceived effectiveness of Panadol Night, a history of insomnia, sleep problem variables, and perceived general and mental health. All analyses were performed in SPSS Version 25.0.

3. Results

3.1. Participant characteristics

A total of 1244 adults residing in the Eastern Province of Saudi Arabia participated in the survey; their characteristics are presented in Table 1. Most of the participants were aged 18–24 years (54.9%), women (69.9%), and resided in Al-Ahsa (68.8%). About 63.7% were unmarried, and 68.5% were unemployed. Participants with bachelor's degrees constituted 62.4% of the sample. About 74.4% of the participants were studying or working in non-health related fields. The majority of the participants (95.2%) reported that they were aware of Panadol Night, 33.0% were aware of Histop (chlorpheniramine), and 24.5% were aware of melatonin. More than half of the participants thought that Panadol Night is used to treat insomnia, while 6.3% thought that Panadol Night can successfully treat chronic insomnia. Regarding the drug safety, 38.4% believed that the use of Panadol Night is safe.

In our sample, 42.3% of the participants reported that they had used Panadol Night at some time during their lifetime, 12.1% used Panadol Night in the past month, and 11.7% were current users. About 12.9% rated their general health as fair/poor. In regard with sleep problems, 8.4% had a history of insomnia, while 44.1% rated their sleep quality in the past month as fair/poor. Among those who had fair/poor sleep quality in the past month, 17.7% used Panadol Night in the past month, and 24.4% of those reporting trouble sleeping due to pain used Panadol Night in the past month.

3.2. Panadol Night users

Table 2 provides data on Panadol Night users (n = 526). Among Panadol Night users, 62.4% used the medication based on family/friends' recommendations, 17.1% were based on pharmacists' recommendations, and 6.5% were based on doctors' recommendations. Nearly a fifth of Panadol Night users reported that they used Panadol Night at specific times in the year; for example, during exam periods and stressful events at work. Regarding the duration of use, 5.5% reported that they used Panadol Night for more than 10 consecutive nights per month. About one-fourth of the users experienced adverse reactions including anticholinergic effects (6.1%), fatigue (5.7%), insomnia (4.6%), headache (3.2%), and abdominal problems (1.3%). Among those who experienced adverse reactions, 14.6% stopped taking Panadol Night and only 1.1% consulted a doctor or pharmacist.

3.3. Factors associated with Panadol Night use

In the bivariate analysis, there were statistically significant associations between Panadol Night use in the past month and numerous factors including age, gender, health related fields, marital status, history of insomnia, perceived safety of Panadol Night, perceived effectiveness of Panadol Night, trouble sleeping due to

Table 1
Characteristics of the study participants (n = 1244).

Variables	N	%
Age in years		
18–24	683	54.9
25–44	410	33.0
≥45	151	12.1
Gender		
Male	374	30.1
Female	870	69.9
Area of residence		
Al Ahsa	856	68.8
Dammam/Khobar	230	18.5
Other	158	12.7
Education		
Less than bachelor	369	29.7
Bachelor	776	62.4
Greater than bachelor	99	7.9
Health related fields		
Yes	318	25.6
No	926	74.4
Marital Status		
Married	452	36.3
Not married	792	63.7
Student		
Yes	673	54.1
No	571	45.9
Employment status		
Employed	392	31.5
Unemployed	852	68.5
Knowledge about OTC sleep aid medications		
Panadol Night	1184	95.2
Valerian	93	7.5
Melatonin	305	24.5
John's wort	61	4.9
Histop (chlorpheniramine)	411	33.0
Knowledge about Panadol Night use		
Pain killer/headache	912	73.3
Insomnia	736	59.2
Other	371	29.8
Do not know	112	9.0
Perceived safety of Panadol Night (i.e., It is safe to use Panadol Night)		
Strongly agree/agree	478	38.4
Neither agree nor disagree	365	29.4
Strongly disagree/disagree	401	32.2
Panadol Night ever-use		
Yes	526	42.3
No	718	57.7
Panadol Night use in the past month		
Yes	150	12.1
No	1094	87.9
Current use of Panadol Night		
Yes	145	11.7
No	1099	88.3
Diagnosed with insomnia		
Yes	104	8.4
No	1140	91.6
Perceived effectiveness of Panadol Night (i.e., Do you think you can treat chronic insomnia with Panadol Night successfully?)		
Yes	78	6.3
No	559	44.9
Not sure	607	48.8
Trouble sleeping due to pain in the past month		
Never/rarely	635	51.0
Sometimes	396	31.8
Often/always	213	17.1
Sleep quality in the past month		
Excellent/very good	381	30.6
Good	314	25.2
Fair/poor	549	44.1
Perceived mental health		
Excellent/very good	800	64.3
Good	274	22.0
Fair/poor	165	13.3
Perceived general health		
Excellent/very good	732	58.8
Good	348	28.0
Fair/poor	161	12.9

Note: Other category for the knowledge about Panadol Night use variable included cold and flu/rash.

pain, sleep quality, and perceived general health (see Table 3). The percentage of men using Panadol Night in the past month was higher than women (15.8% vs. 10.5%, respectively). Moreover, it was observed that a higher proportion of adults in non-health related fields reported using Panadol Night in the past month compared to those in health related fields (13.4% vs. 8.2%, respectively). Panadol Night use was found to be higher among adults who believed that Panadol Night is safe compared to those who did not (14.9% vs. 9.5%, respectively). Adults with fair/poor sleep quality had a significantly higher percentage of using Panadol Night (17.7%) than those reporting excellent/very good sleep quality in the past month (5.2%).

In multivariable logistic regression, we observed statistically significant associations between Panadol Night use and several factors including gender, health related fields, a history of insomnia, perceived safety of Panadol Night, perceived effectiveness of Panadol Night, trouble sleeping due to pain, and sleep quality in the past month. Adults who thought Panadol Night could successfully

Table 2
Behavior of Panadol Night users (n = 526).

Variables	N	%
Recommendations for Panadol Night use		
Doctor		
Yes	34	6.5
No	492	93.5
Pharmacist		
Yes	90	17.1
No	436	82.9
Nurse		
Yes	10	1.9
No	516	98.1
Family/friends		
Yes	328	62.4
No	198	37.6
Internet		
Yes	148	28.1
No	378	71.9
Self-use		
Yes	50	9.5
No	476	90.5
Using Panadol Night at a specific time in the year (e.g., during work stress, study time, or vacations)		
Yes	236	19.0
No	1008	81.0
Using Panadol Night use for more than 10 consecutive nights per month		
Yes	68	5.5
No	1176	94.5
Development of adverse reactions to Panadol Night		
Yes	121	23.0
No	405	77.0
Self-reported adverse reactions		
Insomnia	24	4.6
Fatigue	30	5.7
Headache	17	3.2
Drowsiness	14	2.7
Increased heart rate	9	1.7
Abdominal problems	7	1.3
Other*	9	1.7
Management of adverse reactions		
Stopped taking Panadol Night		
Yes	77	14.6
No	449	85.4
Switched to othrt sleep aids		
Yes	10	1.9
No	516	98.1
Consulted a doctor/pharmacist		
Yes	6	1.1
No	520	98.9
Consulted family/friends		
Yes	4	0.8
No	522	99.2
Did nothing		
Yes	38	7.2
No	488	92.8

Note: *Other adverse reactions reported by the Panadol Night users included blurred vision, dry mouth, and confusion.

Table 3
Characteristics of study participants by Panadol Night use in the past month.

Variables	Panadol Night users		Panadol Night non-users		P-Value
	N	%	N	%	
Age in years					0.035
18–24	97	14.2	586	85.8	
25–44	40	9.8	370	90.2	
≥45	13	8.6	138	91.4	
Gender					0.008
Male	59	15.8	315	84.2	
Female	91	10.5	779	89.5	
Area of residence					0.296
Al Ahsa	98	11.4	758	88.6	
Dammam/Khobar	27	11.7	203	88.3	
Other	25	15.8	133	84.2	
Education					0.078
Less than bachelor	56	15.2	313	84.8	
Bachelor	85	11.0	691	89.0	
Greater than bachelor	9	9.1	90	90.9	
Health related fields					0.014
Yes	26	8.2	292	91.8	
No	124	13.4	802	86.6	
Marital status					0.037
Married	43	9.5	409	90.5	
Not married	107	13.5	685	86.5	
Student					0.231
Yes	88	13.1	585	86.9	
No	62	10.9	509	89.1	
Employment status					0.424
Employed	43	11.0	349	89.0	
Unemployed	107	12.6	745	87.4	
Knowledge about OTC sleep aid medications					0.067
Only Panadol Night	82	13.8	511	86.2	
Other sleep aid medications	68	10.4	583	89.6	
Perceived safety of Panadol Night (i.e., It is safe to use Panadol Night)					0.043
Strongly agree/agree	71	14.9	407	85.1	
Neither agree nor disagree	41	11.2	324	88.8	
Strongly disagree/disagree	38	9.5	363	90.5	
Diagnosed with insomnia					0.001
Yes	23	22.1	81	77.9	
No	127	11.1	1013	88.9	
Perceived effectiveness of Panadol Night (i.e., Do you think you can treat chronic insomnia with Panadol Night successfully?)					<0.001
Yes	22	28.2	56	71.8	
No	58	10.4	501	89.6	
Not sure	70	11.5	537	88.5	
Trouble sleeping due to pain in the past month					<0.001
Never/rarely	53	8.3	582	91.7	
Sometimes	45	11.4	351	88.6	
Often/always	52	24.4	161	75.6	
Sleep quality in the past month					<0.001
Excellent/very good	20	5.2	361	94.8	
Good	33	10.5	281	89.5	
Fair/poor	97	17.7	452	82.3	
Perceived mental health					0.111
Excellent/very good	89	11.1	711	88.9	
Good	33	12.0	241	88.0	
Fair/poor	28	17.0	137	83.0	
Perceived general health					0.007
Excellent/very good	72	9.8	660	90.2	
Good	48	13.8	300	86.2	
Fair/poor	29	18.0	132	82.0	

Note: Other sleep aid medications included valerian, melatonin, St. John wort, and Histop (chlorpheniramine).

treat insomnia were 2.97 times as likely to use Panadol Night than their counterparts (P = 0.001). Compared to those rating their sleep quality as excellent/very good, adults with fair/poor sleep quality were more likely to use Panadol Night (AOR = 2.91, 95% CI = 1.64, 5.14). Adults studying or working in non-health related fields were 1.72 times as likely to use Panadol Night than those in health related fields. We also found that adults who believed that Panadol Night is safe were 1.65 times as likely to use Panadol Night compared to their counterparts. Men were more likely to use Panadol Night than women (AOR = 1.57, 95% CI = 1.05, 2.37).

Table 4
Adjusted odds ratios and 95% confidence intervals of study sample characteristics from logistic regressions on Panadol Night use in the past month.

	AOR	95% CI	P-Value
Age in years			
18–24	1.96	[0.86, 4.50]	0.111
25–44	1.15	[0.56, 2.36]	0.701
≥45 (Ref.)			
Gender			
Male	1.57	[1.05, 2.37]	0.030
Female (Ref.)			
Area of residence			
Al Ahsa	0.65	[0.39, 1.10]	0.111
Dammam/Khobar	0.81	[0.43, 1.51]	0.506
Other (Ref.)			
Education			
Bachelor	0.84	[0.56, 1.26]	0.406
Greater than bachelor	0.76	[0.33, 1.77]	0.529
Less than bachelor (Ref.)			
Health related fields			
No	1.72	[1.05, 2.81]	0.033
Yes (Ref.)			
Marital status			
Married	1.06	[0.62, 1.81]	0.829
Not married (Ref.)			
Employment status			
Employed	1.05	[0.62, 1.78]	0.856
Unemployed (Ref.)			
Knowledge about OTC sleep aids			
Only Panadol Night	1.23	[0.84, 1.79]	0.283
Other sleep aid medications (Ref.)			
Perceived safety of Panadol Night (i.e., It is safe to use Panadol Night)			
Strongly agree/agree	1.65	[1.05, 2.60]	0.031
Neither agree nor disagree	1.20	[0.73, 1.99]	0.474
Strongly disagree/disagree (Ref.)			
Ever diagnosed with insomnia			
Yes	1.90	[1.09, 3.30]	0.023
No (Ref.)			
Perceived effectiveness of Panadol Night (i.e., Do you think you can treat chronic insomnia with Panadol Night successfully?)			
Yes	2.97	[1.60, 5.50]	0.001
Not sure	1.06	[0.71, 1.59]	0.768
No (Ref.)			
Trouble sleeping due to pain in the past month			
Often/always	2.26	[1.39, 3.65]	0.001
Sometimes	1.19	[0.76, 1.86]	0.453
Never/rarely (Ref.)			
Sleep quality in the past month			
Fair/poor	2.91	[1.64, 5.14]	<0.001
Good	2.01	[1.09, 3.71]	0.027
Excellent/very good (Ref.)			
Perceived mental health			
Fair/poor	0.97	[0.56, 1.67]	0.898
Good	0.78	[0.48, 1.27]	0.324
Excellent/very good (Ref.)			
Perceived general health			
Fair/poor	0.99	[0.56, 1.76]	0.973
Good	0.94	[0.60, 1.49]	0.801
Excellent/very good (Ref.)			

Abbreviations: AOR: adjusted odds ratio; CI: confidence interval; Ref.: reference group.
Note: Based on 1244 adults aged over 18 years residing in the Eastern Province of Saudi Arabia. Other sleep aid medications included valerian, melatonin, St. John wort, and Histop (chlorpheniramine).

Table 4 displays adjusted odds ratios (AOR) and 95% confidence intervals (CI) from multivariable logistic regression.

4. Discussion

The present study assessed the prevalence of Panadol Night use among adults in the Eastern Province of Saudi Arabia. In our sample, we found that 42.3% have ever used Panadol Night in their lifetime, and 12.1% used Panadol Night in the past month. The lifetime prevalence of Panadol Night is lower than what was previously observed (67.4%), and that could be due to the population differences (Alhwimani et al., 2021). Our study only focused on the Eastern Province in Saudi Arabia, whereas the previous study included different regions. However, regions included were not clearly stated. Furthermore, the proportion of women in our sample was higher than that in the previous study (69.9% vs. 49.0%). Despite the differences between the current and previous studies, results from both studies highlight the frequent use of Panadol Night in Saudi Arabia. A possible explanation for this could be the accessibility and affordability of Panadol Night as it is available as an OTC medication. Our results revealed that the use of Panadol Night was mostly based on family and friends' recommendations rather than healthcare providers (i.e., physicians or pharmacists), which is not surprising as self-medication behavior is common among Saudis (Al-Ghamdi et al., 2020; Aljadhey et al., 2015). This behavior might result in inappropriate use such as long-term use. In our sample, we found that 5.5% of the Panadol Night users reported long-term use, defined as use for more than 10 consecutive days as indicated in drug facts label. Long-term use of Panadol Night is associated with adverse effects such as orthostatic hypotension, fall risk, and dementia, particularly in elderly (Gray et al., 2015; Panel et al., 2019; Wolfson et al., 2022).

To better understand factors associated with Panadol Night use among adults, we performed a multivariable logistic regression analysis in which we adjusted for independent variables. Findings from this analysis indicated that perceived effectiveness and safety of Panadol Night were significant factors for its use. Adults were more likely to use Panadol Night if they believed it was safe and would help them sleep. This is in line with the health belief model, suggesting that health behaviors are determined by weighing the benefits and risks of a specific health action (Janz and Becker, 1984). In addition, sleep-related factors such as sleep quality, trouble sleeping due to pain, and history of insomnia were found to be positively associated with Panadol Night use. It was expected that adults having sleep problems would be more likely to use Panadol Night compared to those without sleep problems. However, Panadol Night is only indicated for occasional sleep difficulties due to pain, not for all sleep problems as stated in the package insert. Therefore, adults should be educated about the appropriate use of Panadol Night and other pharmacological and non-pharmacological alternatives. Future research should evaluate the inappropriate use of Panadol Night and other OTC sleep aids in Saudi Arabia.

In regard with gender, we surprisingly found that men were more likely to use Panadol Night than women, which is not consistent with previous studies. For example, a study by Alhwimani et al. revealed that the use of OTC sleep aids was higher in women than men in the Saudi population. A similar finding was also observed with the use of prescription sleep aids. In a US study using data from 2005 to 2010, it was found that more women used prescription sleep aids than men (Chong et al., 2013).

Another factor associated with Panadol Night use was health related fields. Adults studying or working in non-health related fields were more likely to use Panadol Night compared to those in health related fields. Given the fact that Panadol Night is an

OTC medication and most of our sample reported that their use was based on self-medication, this finding could be explained by that adults in health related fields were more aware and knowledgeable about other sleep aids compared to those in non-health related fields. This means they might consider other available options than Panadol Night. Our findings demonstrate the need for raising awareness about OTC sleep aids, particularly Panadol Night, among adults in Saudi Arabia. Adults should be educated about the appropriate use of Panadol Night and other sleep aid alternatives. Additionally, community pharmacists can play a crucial role in counseling adults on the appropriate use of Panadol Night during the time of purchase. This can help minimize overuse and unintentional misuse of Panadol Night.

To our knowledge, this was the first study to identify factors associated with Panadol Night use in Saudi Arabia. However, the study findings should be interpreted in the context of its limitations. One of the study limitations was that all data were self-reported and may be subject to recall bias. Further, data were collected via an online survey using a convenience sampling technique; this resulted in a high proportion of young adults and female gender. Future research should study the use of OTC sleep aids, particularly diphenhydramine-containing products, in elderly adults in Saudi Arabia. Given the fact that we used an anonymous online survey, we were unable to verify that the survey was not completed several times by the same participant. Moreover, single items were used to measure the study variables and no formal evaluation of the internal consistency of the questionnaire was performed. However, several questions were adopted from previously validated and reliable surveys including sleep problems as well as general and mental health variables (Barile et al., 2013; Buysse et al., 1989; Ware Jr and Sherbourne, 1992). Based on the feedback from the respondents during the cognitive interviews, all questions were clear and straightforward. Finally, the present study was only conducted in the Eastern Province of Saudi Arabia; thus, its findings cannot be generalized to adults in other regions.

5. Conclusions

Overall, 42.3% of the study sample have used Panadol Night at some time during their lifetime, and 12.1% used Panadol Night in the past month. Adults' perceptions of the safety and effectiveness of Panadol Night were significantly associated with its use. Also, adults studying or working in non-health related fields were more likely to use Panadol Night compared to their counterparts in health related fields. These findings reinforce the need for raising awareness about the appropriate use of Panadol Night. Community pharmacists can play an essential role in reducing the frequent and inappropriate use of Panadol Night through patient consultation.

CRediT authorship contribution statement

Khalid Alhussain: Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Funding acquisition. **Dimah I. Almuayli:** Writing – review & editing. **Sara M. Aldaej:** Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

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