Title: Self-medication among Saudi students and adolescents: a systematic review

Running title: Self-medication among Saudi students and adolescents

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Abstract:

Self-medication involves the administration of medication to treat symptoms or complications with no medical prescription, depending on the experience or knowledge of the individual. Self-medication can result in severe consequences due to allergy to medications and medication interactions that the individual doesn't know. The present study aimed at assessing the prevalence and practice of self-medication among Saudi students and adolescents by reviewing the previous Saudi studies conducted on this subject. The medical literature explored PubMed and Google scholar databases from 2015 till 2021. The included searching terms were a combination of "Self-medication and Saudi students," Self-medication and Prevalence," Self-medication and Saudi Adolescents," and "Saudi prevalence and Self-medication." The inclusion criteria included original articles conducted on Saudi students and adolescents and full text-articles. A total of 70 articles were obtained. Only nine articles were eligible for the inclusion criteria. The nine studies included a total number of 3265 participants and covered seven regions of Saudi Arabia. Analgesics were the most commonly used medication, and the main cause for self-medication was a headache, whereas the significant purpose of practicing self-medication was saving time. Self-medication is highly prevalent and practiced by Saudi students and adolescents; practicing self-medication was also high regardless of the participants' specialty; it was also high among medical students.

Keywords: Self-medication, Saudi students, Saudi Adolescents, Prevalence, Practice.
1. Introduction:

Self-medication (SM) is widely practiced in developing and developed countries; the World Health Organization (WHO) defined SM as the selection and usage of medications by individuals to treat themselves for a self-recognized symptom or disease [1]. SM was cited as a common problem leading to incorrect medication use [2]. SM also includes using alternative and traditional medicine such as herbal medicines, traditional products, and nutritional supplements [3]. Non-prescribed medication or over-the-counter refers to medicines for self-medication and are available in pharmacies without the prescription of the doctor [4,5]. Over the counter drugs reduce the number of visits to physicians and save time; however, the misuse of drugs may result in severe side effects, the interaction between drugs can occur, and the overdosing can result in bad consequences; all these can adversely affect the health of the individuals [6]. Analgesics are used for pain management; pain killers are considered one of the most commonly abused medications globally. Analgesics include acetaminophen (paracetamol), aspirin, and nonsteroidal anti-inflammatory drugs (NSAIDs) [7]. Paracetamol has antipyretic and analgesic effects, whereas NSAIDs have anti-inflammatory, antipyretic, and analgesic actions [8-10]. Both paracetamol and NSAIDs have adverse side effects, especially when used improperly, such as using them with no medical prescription or consulting the physician or the pharmacist. They are associated with liver, nervous system, kidney, and gastrointestinal tract [11-14]. Using antibiotics with no prescription is an emergence of antibiotic resistance [15]. Saudi Arabia reported the highest prevalence of resistant microbes in clinical isolates among Gulf Corporation Council countries [16]. Resistance of the microorganisms to the medication will lead to failure of treatment and threaten the life of the patients [17,18]. Several studies demonstrated that self-medication begins with adolescence and increases with increasing age [19-21]. Self-medication among adolescents and university students represents an emerging topic in scientific research [22]. So, this systematic review was performed to identify the prevalence and practice of self-medication among Saudi adolescents and students.
2. Literature Search

The PRISMA checklist guidance for systematic review and meta-analysis [23] was followed to write this systematic review. Revising electronic databases was done to select eligible research articles between the year 2015 and the year 2021, including two databases: PubMed and Google scholar databases. Several keywords were used for searching purposes, including a combination of "Self-medication and Saudi students," Self-medication and Prevalence," Self-medication and Saudi Adolescents," and "Saudi prevalence and Self-medication." All the titles and abstracts produced from this primary exploration were revised thoroughly to prevent missing potential studies. The findings were then examined to choose only original research articles evaluating the prevalence and practicing of self-medication of Saudi students and Saudi adolescents. All articles from Saudi Arabia were eligible. Only articles in English were defined as articles of relevance, which were then included in the second stage.

2.1 Eligibility criteria:

The second step was deciding on the eligible studies' inclusion criteria. Abstracts were assessed manually to select the relevant studies for revision. The inclusion criteria were studies conducted on adolescents and students, cross-sectional and descriptive studies conducted on students from Saudi universities. The final stage was gathering the pre-defined information from the final record of eligible articles and summarizing them. Reviews, studies that had incomplete or overlapped data were excluded. Also, unavailable full-text articles or inappropriate study designs were excluded. The full description of the search strategy is shown in figure 1.
3. Data review and analysis:

Stage one in the data review included a preliminary review; data was extracted using a specially designed excel sheet. Chosen data from eligible research articles were then revised via the excel sheet. Any articles published by one research group examining similar variables were reviewed for any potential duplication.

4. Results:

This systematic review included nine articles that met the eligible criteria [24-32] (Table1). Regarding the study design, all studies were cross-sectional. And three studies were cross-sectional descriptive [24, 25, 31], and one study was an
observational cross-sectional [28]. The total number of participants in the eight studies was 3265 participants; of them, there were 400 adolescents [28], and 2865 were university students [24-27, 29-32]. The university students were from nursing college [24, 25], health sciences colleges [26], medical colleges [27, 29, 31], medical and pharmacy [29], medical and non-medical [32]. The age range of participants in the studies was 13-25 years old. Two studies included females, students, only [24, 25], whereas the other seven included both genders [26-32]. The studies aimed to investigate the prevalence of self-medication among the participants. The studies were conducted on different regions in Saudi Arabia including, the University of Tabuk [24], Jazan University [25, 30], Riyadh Universities [26] and high schools in Riyadh [29], King Khaled University in Abha [27], Imam Abdulrahman Bin Faisal University in Dammam [29], King Abdul-Aziz University in Jeddah [31], and the University of Taibah in Madinah [32].

There were several types of medication reported as used by self-medications, including analgesics, traditional medicine, skin ointment, nutritional supplements, cough syrups, drops for eye and ears, NSAIDs, antibiotics, medications for cold and flu, creams, antihistamines, sedatives, and antipyretic. Analgesics were reported by eight studies [24, 25, 26, 27, 28, 29, 31, 32], antibiotics were reported by five studies [27, 29, 30, 31, 32], NSAIDs were reported by four studies [24, 25, 26, 31], cough, fever, and cold medications were reported by three studies [24, 28, 32], antihistamines were reported in three studies [29, 31, 32], sedatives were reported in one study [30]. Analgesics were the most common medication used by self-medication, with the highest prevalence reported to be 96.5%, [26] represented in administrating paracetamol. In contrast, the least prevalence was reported to be 21.8%, and it was also reported as paracetamol [31]. The prevalence of antibiotics usage was the highest at 35.4% [27], and it was the least at 2.5% [31]. NSAIDs were in the second rank used as self-medication; the highest administration was reported as 49.1% [26], whereas the least prevalence was reported as 3.9% [31].

The prevalence and practice of self-medication ranged from 98.7% [27] to 19.61% [29]. Seven studies reported the main reason for practicing self-medication [24, 25, 26, 27, 29, 30, 32], and the most common was time-saving. The major complications caused by self medications were reported by eight studies [24, 25, 26, 27, 28, 30, 31, 32], and they were headache, runny nose, menstrual pain, fever, cough, cold, and sore
throat. Only three studies reported the source of obtaining the medication administrated by self-medication [24, 28, 29]; the main source was the pharmacy.

5. Discussion:

Self-medication is used to treat or prevent minor symptoms or ailments, which don't justify medical consultation [22]. The prevalence of self-medication in the Middle East was in the range of 19% to 82%, as reported by a systematic review that included 22 studies [33]. The rate of self-medication in Riyadh was 78.7% among 681 patients at Al Wazarat health care center [34]. A study from Qassim conducted on the population attending community pharmacies for over-the-counter medication reported that 75% purchased non-prescribed medication [35].

This systematic review was conducted to investigate self-medication's overall prevalence and practice among Saudi students and adolescents. This systematic review included studies that covered seven regions in Saudi Arabia. The studies included were matched in the design; all the studies [24-28, 30-32] reported a higher prevalence of self-medication that exceeded fifty percent in all the studies, except for one study [29] reported a prevalence of less than fifty percent. That study was conducted on medical and pharmacy students; the practice was higher among medical students (49.3%) than pharmacy students (19.61%). The remaining eight studies [24-28, 30-32] reported a prevalence ranged between 98.7% [27] and 64.8% [32].

The prevalence of self-medication among adolescents was reported to be in the range of 2% to 92% [36-38]. In this systematic review, only one study included adolescents [28], and the prevalence of self-medication was 94.5% higher than what was reported in the previous studies[36-38].

The current systematic review showed that analgesics were the most common and highly used medication and paracetamol was the central used analgesics. Paracetamol usage was reported to be 96.5% [26]; only one study said a low prevalence of paracetamol usage (21.8%) [31]. The second rank of usage was NSAIDs; the highest usage of NSAIDs was reported in one study only [26], 49.1%. Surprisingly, antibiotics were in the third rank, where only five studies [27, 29, 30, 31, 32] reported that antibiotics were used by self-medication. The highest prevalence rate of self-
administrated antibiotics was 35.4% [27], and the least rate was 2.5% [31]. This can be attributed to the efforts performed for the reduction of over usage of antibiotics and its severe consequences such as resistance of bacteria to the antibiotics. However, the high usage of analgesics is alarming, and efforts should be exerted to increase the knowledge of students and the population in general regarding the over usage of analgesics.

Analgesics were the most reported medication (18.3%) purchased without a prescription, as reported from a study from the Qassim region, followed by antihistamines and antibiotics in the third rank [35]. Similarly, a previous Saudi study reported that the rate of self-medication of antibiotics was 34% among 1264 individuals living in Saudi Arabia [15], which was similar to our findings. In another Saudi study conducted on 2979 patients, 84.1% reported using analgesics for self-medication [39]. This means that the prevalence of self-medication of antibiotics didn’t vary between the general population and specific adolescent population.

Analgesics' usage isn't restricted to Saudi Arabia; a previous systematic review included studies conducted on adolescents [22]. The most commonly used medications were pain killers, antipyretics, cough and cold medications, dermatological medicines, nutritional supplements, and antibiotics. In Jordan, it was found that 61.3% of university students used analgesics as self-medication. Although the study revealed that antibiotics were also in the third rank among the medication used, the prevalence was much higher than all the included studies in this systematic review, as it was 65.7% [40]. In Nigeria, self-medication analgesia was reported by 34.3% of the pharmacy students who participated, followed by antibiotics 25.2% [41].

Paracetamol was reported to be the major analgesics used in our systematic review; however, paracetamol was responsible for 50% of self-poisoning cases and cases around 200 deaths annually [42]. The drug shows no age discrimination [43]; it is contraindicated in case of allergy of the drug ingredients, patients with severe renal or hepatic failure, and deficiency of methemoglobin reductase [44]. The high prevalence of using paracetamol in the studies of this systematic review can be attributed to the low awareness among students and adolescents about the adverse effects of paracetamol; however, the majority of students of the included studies were related to the medical field. A previous Saudi study that included 1554 participants showed that
paracetamol was the main analgesic used, and 70.9% reported that they would consult a physician or pharmacist if their pain didn't get relief after administrating paracetamol by themselves. Moreover, 29% had no awareness about the possible adverse effects of analgesic usage [45].

Also, the increased usage of NSAIDs is associated with an increased risk of ulcers and bleeding, which threaten the patient's life [45]. NSAIDs are contraindicated in case of NSAIDs allergy, severe liver, and kidney insufficiency, pregnant and breastfeeding mothers, and in case of the active peptic ulcer [46]. Our analysis showed that NSAIDs were in the second rank after using paracetamol, another alarming.

The most prevalent complaints experienced by the study population were reported to include ear problems, cough, headache, cold, fever, cold, and skin complaints [47]. The major cause for self-administration of medication was the headache, menstrual cramps, fever, cold, and sore throat. The major reason for not visiting a doctor and refusing to self-medication was saving time. They may wait for the physician and have no time to visit the doctor; some reports that the complaints were mild, and some reported having an experience. In a previous Saudi study conducted on the population attending community pharmacies in the Qassim region, it was found that the reasons for self-medication included repetition of a previously prescribed medication by a health care professional as the significant reason, followed by the disease is minor, and shortness of time was the least reported reason [35].

Similar findings were reported from Jordan, where the university students reported that headache is the major cause for self-medication, followed by colds and flu and fever. The lack of time to visit was the third reason for self-medication, [40] whereas, in our findings, it was the major reason.

In Saudi Arabia, antibiotics can be purchased with no prescription, and it was found in Riyadh that 79% of participants purchased antibiotics with no prescription [34]. Moreover, it was reported that 77.6% of the Saudi pharmacists dispensed antibiotics without prescription [48]. Out of the nine studies, only three [24, 28, 29] investigated the place of obtained medication. The primary source was the pharmacy, and the other sources reported were parents and home medicine. A previous study [47] also reported that the source of medicine obtained by adolescents was community
pharmacy, whereas the source for headaches and menstrual pain was home medicine [47].

6. Conclusion:

Self-medication is highly prevalent and practiced by Saudi students and adolescents. Practicing self-medication was also high regardless of the participants' specialty; it was also high among medical students. Analgesics were the most commonly used medication, and the leading cause for self-medication was a headache, whereas the significant purpose of practicing self-medication was saving time. The high usage of analgesics by self-medication seems to be similar to antibiotics, and it requires great attention. An online consultation can save time and prescribe the correct medication, especially since the reported conditions are simple and don't require medical investigations such as headache and menstrual cramps; these can reduce the rate of self-medication. This can help minimize self-medication, especially during the COVID-19 pandemic, where gathering should be avoided. Also, pharmacists shouldn't give the patients medications without medical prescriptions.

List of Abbreviations:

NSAIDs Nonsteroidal anti-inflammatory drugs
SM Self-medication
WHO World Health Organization

Conflict of interest The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent to participate Not applicable.

Ethical approval Not applicable.
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### Table 1: Studies considered for the review

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<th>Author and Publication year</th>
<th>Study design</th>
<th>Population, Sample size and Age of participants</th>
<th>Objective and settings</th>
<th>The most common medication used</th>
<th>Results and main findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guitierrez et al 2020 [24]</td>
<td>Cross-sectional descriptive</td>
<td>-128 Female nursing students -Age: 19-25 years</td>
<td>-To determine the prevalence and practice of self-medication among female nursing students of the University of Tabuk -University of Tabuk</td>
<td>-Analgesic (90.2%) -Traditional medicines (62%) -Skin ointment (40.2%) -Nutritional supplements (36.3%) -Cough syrup, eye/ear drops (23.5%)</td>
<td>*High prevalence of self-medication (79.7%) *The major cause for self-medication was saving time (51%) *Complications caused usage; headache (76.6%), runny nose (37.3%), dental pain (37.3%), wounds (25.5%) *medicines for self-medications obtained from; pharmacy (87.5%)</td>
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<td>Faqihi &amp; Sayed 2020 [25]</td>
<td>Cross-sectional descriptive</td>
<td>-177 Female nursing students -Age 20±3 years</td>
<td>-To generate data on self-medication practice among nursing undergraduate students - Department of nursing,</td>
<td>-Analgesics; Acetaminophen (57%) -NSAIDs; Ibuprofen (20%), diclofenac (5%), meloxicam (3%)</td>
<td>*High self-medication practice (87%) *Main reason for self-medication; lack of time to consult doctor (68%)</td>
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<tr>
<td>Study</td>
<td>Design</td>
<td>Sample Size</td>
<td>Methods</td>
<td>Findings</td>
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<td>Al Essa et al 2019 [26]</td>
<td>Cross-sectional</td>
<td>-272 health sciences students (males+females) from different universities</td>
<td>- Age; &lt;20- &gt;22 years old</td>
<td>- Analgesics; paracetamol (96.5%), NSAIDs (49.1%)</td>
<td>*High practice of self-medication (73.2%) *Main reason for self medication; wasn to play an active role regarding their health (47.4%), long time waiting for physician (39%), don’t visit the physician for minor illness (26%). *The major causes for self-medication; headache (92%), fever (52.2%), menstrual cramps (43.8%), cold (38.9%)</td>
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<td>Alshahra ni et al 2019 [27]</td>
<td>Cross-sectional</td>
<td>-528 students (males+females); 274 medical</td>
<td>- To explore the pattern of self-medications</td>
<td>-Pain killers (91.6%) reported by medical</td>
<td>*High practicing self-medication</td>
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<td>Albatti et al 2017 [28]</td>
<td>Observational crpss-sectional</td>
<td>400 students (males+females)</td>
<td>- Age: 13-18 years - To estimate the prevalence of self-medication among adolescents aged 13-18 years of both genders in Riyadh, Saudi Arabia - Private and governmental Intermediate and high schools in Riyadh</td>
<td>- Analgesics (87.3%) - In the second rank was; cold and flu medication (56.7%) reported by males, creams (54.5%) reported by females</td>
<td><em>High prevalence of self-medications (94.5%)</em></td>
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<tr>
<td>Albusalih et al 2017 [29]</td>
<td>Cross-sectional</td>
<td>450 students (males+females); 297 from medicine college, 153</td>
<td>- To report self-medication prevalence of</td>
<td>- Analgesics (72.35%) - Anti-histamines (39.16%)</td>
<td><em>Self-mediation among pharmacy students</em></td>
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<tr>
<td>Source</td>
<td>Design/Methodology</td>
<td>Participants</td>
<td>Knowledge, Attitude and Magnitude of Self-Medication Among Medical Students of Jazan University, Jazan</td>
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| Albasheer et al 2016 [30]     | Cross-sectional, self-administered questionnaire based study                        | 300 medical students (males+females)                                         | *High prevalence of self-medication (83.7%)                                                        *
|                               |                                                                                    | - Age; 19-24 years                                                           | The main reason for self-medication: having sufficient information, previous experience               |
|                               |                                                                                    | - To assess the knowledge, attitude and magnitude of self-medication among   | *The major causes for self-medication: pain (69%), cold (45%), cough (34%), heart burn (24%),           |
|                               |                                                                                    | medical students of Jazan University, Jazan                                  | migraine (23%)                                                                                        |
|                               |                                                                                    | - Sedatives (58.6%)                                                          | *Obtained medication from; pharmacy (68%), available in house (30.9%)                                |
|                               |                                                                                    | - Antibiotics (15.33%)                                                       |                                                                                                      |

- Pharmacy college - Age: 18-23 years old
- Prescription and non-prescription drugs among pharmacy and medical students - Pharmacy and medicine colleges of Imam Abdulrahman Bin Faisal University in Dammam
- Antibiotics (16.59%)
- Self-medication among medical students (49.3%)
- The main reason for self-medication: mild problems (35.1%), previous experience (14.2%)
- Obtained medication from; pharmacy (68%), available in house (30.9%)
<table>
<thead>
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<th>Study</th>
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<th>Objectives</th>
<th>Medications Used</th>
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<tr>
<td>Aashi et al 2016 [31]</td>
<td>Descriptive cross-sectional</td>
<td>507 medical students (males+females) Age; not stated</td>
<td>- To investigate the irrational uses of these medications which are NSAIDS, paracetamol, antibiotic antihistamines, opioids, and anti-anxiety drugs among medical students in KAU - Medical college of King Abdul-Aziz university in Jeddah</td>
<td>- Paracetamol (21.8%) -NSAIDs (3.9%) - Anti-histamine (3.7%) - Antibiotics (2.5%)</td>
<td>*High rate of self medication (74%) *The major causes; relief of fever (20.4%), sore throat (13%), moderate muscle and joint pain (12.1%)</td>
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<td>Aljaouni et al 2015 [32]</td>
<td>Cross-sectional</td>
<td>503 students; medical (349), non-medical (154) Age; &lt;20- &gt;24years</td>
<td>- To assess students' practices, knowledge, awareness and the reasons behind self-medication at Taibah University, Madinah - Taibah University, Madinah</td>
<td>- Analgesics (60.3%) - Antibiotics (30.6%) - Antipyretics (5.6%) - Antihistamines (1.1%)</td>
<td>*Self medication (64.8%) *Higher prevalence among medical students (66%), *The main reason for self-medication was experience in self-medication *The major causes; sore throat &amp; upper respiratory tract infection</td>
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<td>(42.9%) headache (35.9%), fever (14.1%)</td>
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