

# Assessment of the Prevalence of the Use of Nasal Decongestants Among the General Population in Saudi Arabia

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## Abstract

### Background

A topical nasal decongestant (NDC) is widely prescribed in ENT practice and used as self-medication because it is available over the counter, which makes it an easily accessible medication. Due to its common and long-term use, it is associated with serious nasal complications. It is commonly self-administered in many otolaryngology diseases like the common cold, sinusitis, and acute or chronic rhinitis. The long-term usage of nasal decongestants is associated with significantly increased side effects.

### Aim

To assess the prevalence of the usage of nasal decongestants among the general population in Saudi Arabia and the pattern of its use.

### Methodology

A questionnaire-based, cross-sectional survey was applied to level all available populations in Saudi Arabia. Participants with ages aged 10 to 60 years old in Saudi Arabia were invited to participate in the survey. Data were collected from participants using a predesigned online questionnaire. The questionnaire included the participant's demographic data, NDC use, and pattern of use. The questionnaire was uploaded online by researchers and their friends using social media platforms.

### Results

A total of 1456 participants completed the study questionnaire. Participants ages ranged from 10 to 60 years with a mean age of  $26.9 \pm 12.4$  years old. Exact 585 (40.2%) participants were males and 1270 (87.2%) were from urban regions. A total of 657 (45.1%) respondents reported using nasal decongestants while 799 (54.9%) did not use NDC. As for the duration of use, 70.8% used NDC for less than five days and 13.5% used it for 5-15 days. The most reported causes of using NDC were nasal obstruction (62.7%) and common cold (25.7%).

### Conclusions

In conclusion, the study revealed that the frequency of using nasal decongestants was common (45.1%) in the study. More efforts should be paid to improve public awareness regarding indications, duration of use, and method of using nasal decongestants to avoid rebound reactions that may affect patients' daily life activities.

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**Categories:** Otolaryngology, Allergy/Immunology, Epidemiology/Public Health

**Keywords:** saudi arabia, population, pattern of use, prevalence, utilization, nasal congestion, nasal decongestants

## Introduction

Nasal congestion mainly occurs due to the dilatation of nasal blood vessels that enlarge to partially or even completely obstruct the airflow in one both nasal passages. Nasal obstruction with nasal congestion can be discriminated from anatomical obstruction through the application of a topical nasal decongestant spray [1]. The topical nasal decongestant constricts nasal blood vessels and opens up the airways. Nasal decongestants (NDC) are medications usually used in otolaryngology for the management of nasal and sinus congestion, seasonal rhinitis, common cold, and allergic rhinitis [2]. Allergic rhinitis is a nasal disorder that is diagnosed among about 10% to 20% of the population and 15% to 25% of children and young adults [3]. Nasal decongestants are strong vasoconstrictive agents and are usually used in relieving nasal congestion associated with some nasal conditions, including allergic rhinitis, upper respiratory allergies, rhinosinusitis,

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nasal polyps, and hypertrophy [4,5]. Nasal decongestants feature rapid onset effects with the fast relief of symptoms. Some decongestants, such as brimonidine tartrate, are sometimes prescribed for ocular mucosa to treat other conditions like conjunctivitis, ocular hypertension, and open-angle glaucoma [6]. Though the use of nasal decongestants for a long duration may cause adverse effects such as iatrogenic rhinitis [7]. Consequently, the local application of decongestants may be used only for short periods of time and not recommended to be used for a period exceeding four or five days, to avoid the hazard of mucosal injury and rebound vasodilation [8]. Besides the prolonged use of decongestants affects the sensitivity of alpha receptors, with a need for higher doses in shorter pauses to get the same effect. So patients should use excessive doses of nasal decongestants [9]. Many drugs are used for nasal congestion but the most effective drugs used comprise phenylephrine, pseudoephedrine, oxymetazoline, naphazoline, and xylometazoline [10,11]. Mostly having antihistamines with decongestants showed significant relief in allergic conditions [12]. It is thought that the use of nasal decongestants is common in patients who have nasal symptoms, especially patients with nasal obstruction and it has serious effects on health but there is still a lack of studies to identify the size of the problem is Saudi Arabia and more specifically in Taif city. The main aim of this study was to identify the prevalence of using nasal decongestants among the general population in Saudi Arabia and their pattern of use.

## Materials And Methods

A questionnaire-based cross-sectional survey was applied to all available populations in Saudi Arabia. Participants aged 10 to 60 years old in Saudi Arabia were invited to participate in the survey. Data were collected from participants using a pre-designed online questionnaire. The study authors constructed the questionnaire after a comprehensive literature review and expert consultation. The tool was reviewed by a group of three experts in the study issue to check its clarity and content validity. The questionnaire included the following data: participants' socio-demographic data like age, gender, education, and monthly income. Also, participants' habits, including smoking, work section, and their awareness regarding nasal decongestant use patterns were included. The second section covered the frequency of nasal decongestant use frequency and patterns such as duration of use, frequency of daily use, type of used NDC, improvement after use, and related complications. The questionnaire was uploaded online using social media platforms by researchers and their friends and all eligible persons were invited to fill it out after explaining the purpose and confirming their data confidentiality.

The IRB Registration Number for Research was KACST, KSA, HAP-02-T-067; approval number 589.

After data were extracted, it was revised, coded, and fed to statistical software IBM SPSS version 22 (IBM Corp, Armonk, NY). All statistical analysis was done using two-tailed tests. A p-value less than 0.05 was statistically significant. Descriptive analysis based on frequency and percent distribution was done for all variables, including participants' socio-demographic data related to gender, residence, education, marital status, and income. Also, smoking history was tabulated with work area and perception of using nasal decongestants. The prevalence of use of nasal decongestants was graphed while the pattern of use was presented in frequency tables. Crosstabulation was used to assess factors associated with nasal decongestant use among study participants and to assess factors associated with complications experienced. Relations were tested using the Pearson chi-square test and the exact probability test for small frequency distributions.

## Results

Table 1 shows the bio-demographic data of the study participants in Saudi Arabia. A total of 1456 participants completed the study questionnaire. Exactly 67.3% were from the Western region, 13.5% were from the Eastern region, 8.4% from the Central region, 8.2% from the Southern region, and 2.5% were from the Northern region. The participant's ages ranged from 10 to 60 years with a mean age of  $26.9 \pm 12.4$  years. Exactly 585 (40.2%) participants were males and 1270 (87.2%) were from urban regions. Considering marital status, 785 (53.9%) were married and 610 (41.9%) were single. As for educational level, 1120 (76.9%) were university graduates while 293 (20.1%) had a secondary level of education. Monthly income less than 5000 SR was reported among 34.1% of the participants while 45.5% had a monthly income of 5000-15000 SR. A total of 182 (12.5%) were smokers and 1195 (82.1%) were non-smokers. Among smokers, 129 (70.5%) smoked one to two packets per day. As for job titles, 435 (29.9%) were not working/students, 621 (42.7%) worked in the non-healthcare sector, and 400 (27.5%) worked in the healthcare sector. Exactly 1243 (85.4%) participants thought there are negative effects of using decongestants for a long time, and 864 (59.3%) reported the recommended duration for using decongestants of three to five days while 331 (22.7%) reported less than 3 days.

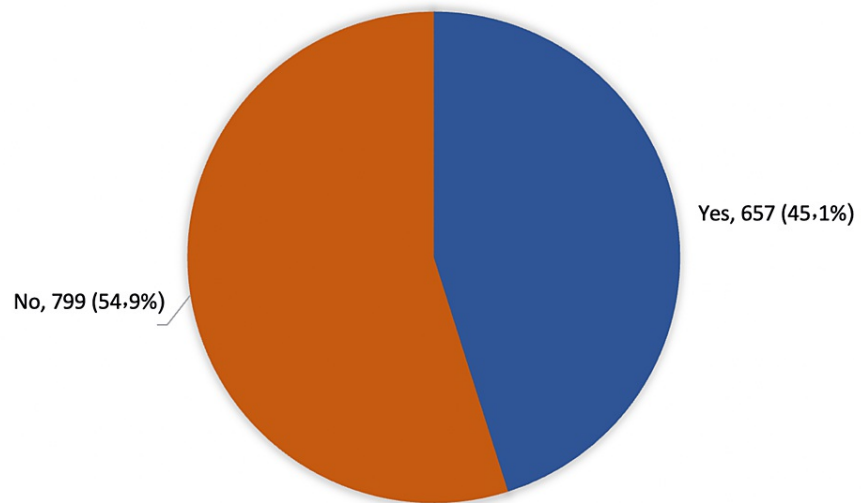
| Bio-demographic data |          | No  | %     |
|----------------------|----------|-----|-------|
| Region               | Central  | 123 | 8.4%  |
|                      | Northern | 36  | 2.5%  |
|                      | Eastern  | 197 | 13.5% |

|   |                         |      |       |
|---|-------------------------|------|-------|
|   | Western                 | 980  | 67.3% |
|   | Southern                | 120  | 8.2%  |
| Age in years  | 10-18                   | 41   | 2.8%  |
|   | 19-30                   | 722  | 49.6% |
|   | 31-40                   | 315  | 21.6% |
|   | 41-60                   | 378  | 26.0% |
| Gender  | Male                    | 585  | 40.2% |
|   | Female                  | 871  | 59.8% |
| Residence   | Urban                   | 1270 | 87.2% |
|   | Rural                   | 186  | 12.8% |
| Marital status  | Single                  | 610  | 41.9% |
|   | Married                 | 785  | 53.9% |
|   | Divorced / widow        | 61   | 4.2%  |
| Educational level   | Below secondary         | 43   | 3.0%  |
|   | Secondary               | 293  | 20.1% |
|   | University / above      | 1120 | 76.9% |
| Monthly income  | < 5000 SR               | 496  | 34.1% |
|   | 5000-15000 SR           | 633  | 43.5% |
|   | > 15000 SR              | 327  | 22.5% |
| Smoking   | Current smoker          | 182  | 12.5% |
|   | Ex-smoker               | 79   | 5.4%  |
|   | Non-smoker              | 1195 | 82.1% |
| How many packets / day  | < 1 packet / day        | 47   | 25.7% |
|   | 1-2 packets / day       | 129  | 70.5% |
|   | > 2 packets / day       | 7    | 3.8%  |
| Work section  | Not working / student   | 435  | 29.9% |
|   | Healthcare sector       | 400  | 27.5% |
|   | Non-healthcare sector   | 621  | 42.7% |
| Do you think there are negative effects of using decongestants for a long time? | Yes                     | 1243 | 85.4% |
|   | No                      | 213  | 14.6% |
|   | Only 1 day              | 88   | 6.0%  |
| Recommended duration for using decongestants                                    | < 3 days                | 331  | 22.7% |
|   | 3-5 days                | 864  | 59.3% |
|   | No recommended duration | 173  | 11.9% |

**TABLE 1: Bio-demographic data of study participants in Saudi Arabia**

SR: Saudi Riyal

Figure 1 shows that a total of 657 (45.1%) respondents reported using nasal decongestants while 799 (54.9%) did not.



**FIGURE 1: Prevalence of using nasal decongestants among the general population in Saudi Arabia**

Table 2 shows the pattern of nasal decongestant use in the study population in Saudi Arabia. As for the duration of use, 70.8% used NDC for less than 5 days, and 13.5% used it for 5-15 days. Exactly 41.1% of the users reported using NDC 2 times/day while 22.8% used it 3 times/day. The most used NDC were Otrivin (76%), followed by Xylomet (9.4%), Apathist (6.2%), and Decozal (2.1%). The most reported causes of using NDC were nasal obstruction (62.7%), common cold (25.7%), itchiness (3.7%), and sneezing (3.5%). A total of 26% of the users reported using oral antihistamines with NDC, 22.1% used paracetamol, and 43.5% not used any other medications. NDC use was recommended by physicians among 54.8% of the users, by pharmacists among 21%, 12.8% by family, and 4.3% by friends. Exactly 65.3% were advised about how to use NDC. A total of 89.6% of the users consume one bottle of NDC per month, and 95.7% reported improved symptoms with NDC use while only 8.1% were diagnosed by a physician for any complications.

| Pattern of use                         | No                 | %         |
|--|--------------------|-----------|
| Duration of using decongestant         | < 5 days           | 465 70.8% |
|  | 5-15 days          | 89 13.5%  |
|  | 15-30 days         | 24 3.7%   |
|  | 2-6 months         | 14 2.1%   |
|  | 7-12 months        | 16 2.4%   |
|  | 2-5 years          | 16 2.4%   |
|  | > 5 years          | 33 5.0%   |
| Frequency of using decongestants / day | 1 time / day       | 120 18.3% |
|  | 2 times / day      | 270 41.1% |
|  | 3 times / day      | 150 22.8% |
|  | 4 times / day      | 14 2.1%   |
|  | 5 or more / day    | 14 2.1%   |
|  | Only with symptoms | 89 13.5%  |
|  | Otrivin            | 499 76.0% |
| Xylomet                                | 62 9.4%            |           |
| Apathist                               | 41 6.2%            |           |
|  |                    |           |

|  |                                     |                   |       |
|--|-------------------------------------|-------------------|-------|
| Type of used nasal decongestant                              | Decozal                             | 14                | 2.1%  |
|  | Nasonex                             | 9                 | 1.4%  |
|  | Avamys                              | 6                 | .9%   |
|  | Xylo-Acino                          | 6                 | .9%   |
|  | Otrizethic                          | 3                 | .5%   |
|  | Rhinocort                           | 3                 | .5%   |
|  | Saltwater                           | 3                 | .5%   |
|  | Levocapastine                       | 2                 | .3%   |
|  | Rinoclenil                          | 2                 | .3%   |
|  | Livostin                            | 1                 | .2%   |
|  | Nasacort                            | 1                 | .2%   |
|  | Nasonex                             | 1                 | .2%   |
|  | RHINASE                             | 1                 | .2%   |
|  | Rinoclenil100                       | 1                 | .2%   |
|  | Sinoclear                           | 1                 | .2%   |
|  | Sterimar                            | 1                 | .2%   |
|  | Causes of using nasal decongestants | Nasal obstruction | 412   |
| Common cold  |                                     | 169               | 25.7% |
| Itchiness  |                                     | 24                | 3.7%  |
| Sneezing   |                                     | 23                | 3.5%  |
| Rhinosinusitis   |                                     | 16                | 2.4%  |
| Allergic rhinitis  |                                     | 13                | 2.0%  |
| Other medications used with NDC                              | None                                | 286               | 43.5% |
|  | Oral antihistamine                  | 171               | 26.0% |
|  | Paracetamol                         | 145               | 22.1% |
|  | Others                              | 55                | 8.4%  |
| NDCs were recommended by                                     | Physician                           | 360               | 54.8% |
|  | Pharmacist                          | 138               | 21.0% |
|  | Family                              | 84                | 12.8% |
|  | Friends                             | 28                | 4.3%  |
|  | My self                             | 25                | 3.8%  |
|  | Internet                            | 22                | 3.3%  |
| Any person offered advice on how to use a nasal decongestant | Yes                                 | 429               | 65.3% |
|  | No                                  | 228               | 34.7% |
| Main site for purchasing the nasal decongestant              | Pharmacy                            | 470               | 71.5% |
|  | Hospital                            | 187               | 28.5% |
| How many bottles used per month?                             | One                                 | 589               | 89.6% |
|  | Two                                 | 45                | 6.8%  |
|  | Three                               | 9                 | 1.4%  |
|  | 4 / more                            | 14                | 2.1%  |

|  |     |     |       |
|--|-----|-----|-------|
| Do your symptoms improve with the use of a decongestant? | Yes | 629 | 95.7% |
|  | No  | 28  | 4.3%  |
| Are you diagnosed by a physician for any complications?  | Yes | 53  | 8.1%  |
|  | No  | 604 | 91.9% |

**TABLE 2: Pattern of nasal decongestant use among the study population in Saudi Arabia**

NDC: nasal decongestant

Table 3 shows factors associated with nasal decongestant use among study participants in Saudi Arabia. The highest reported utilization rate was among young participants (63.4% of those aged 10-18) compared to 43.8% of those aged and 51.9% for those aged 41-60 years with recorded statistical significance (P=.001). Also, 61.6% of single participants used NDC versus 49.2% of the separated group (P=.001). Additionally, NDC use was reported among 60.3% of healthcare workers in comparison to 50.4% of non-healthcare workers (P=.007). Besides, 56.6% of those who think there are negative effects of using decongestants for a long time used NDC versus 45.1% of others who did not (P=.002).

| Factors           |                    | Do you use a nasal decongestant? |       |     |       | p-value             |
|-------------------|--------------------|----------------------------------|-------|-----|-------|---------------------|
|                   |                    | Yes                              |       | No  |       |                     |
|                   |                    | No                               | %     | No  | %     |                     |
| Region            | Central            | 53                               | 43.1% | 70  | 56.9% | .638                |
|                   | Northern           | 18                               | 50.0% | 18  | 50.0% |                     |
|                   | Eastern            | 95                               | 48.2% | 102 | 51.8% |                     |
|                   | Western            | 432                              | 44.1% | 548 | 55.9% |                     |
|                   | Southern           | 59                               | 49.2% | 61  | 50.8% |                     |
| Age in years      | 10-18              | 15                               | 36.6% | 26  | 63.4% | .001* <sup>\$</sup> |
|                   | 19-30              | 287                              | 39.8% | 435 | 60.2% |                     |
|                   | 31-40              | 172                              | 54.6% | 143 | 51.6% |                     |
|                   | 41-60              | 183                              | 48.4% | 195 | 51.9% |                     |
| Gender            | Male               | 262                              | 44.8% | 323 | 55.2% | .832                |
|                   | Female             | 395                              | 45.4% | 476 | 54.6% |                     |
| Residence         | Urban              | 575                              | 45.3% | 695 | 54.7% | .761                |
|                   | Rural              | 82                               | 44.1% | 104 | 55.9% |                     |
| Marital status    | Single             | 234                              | 38.4% | 376 | 61.6% | .001*               |
|                   | Married            | 392                              | 49.9% | 393 | 50.1% |                     |
|                   | Divorced / widow   | 31                               | 50.8% | 30  | 49.2% |                     |
| Educational level | Below secondary    | 18                               | 41.9% | 25  | 58.1% | .891                |
|                   | Secondary          | 131                              | 44.7% | 162 | 55.3% |                     |
|                   | University / above | 508                              | 45.4% | 612 | 54.6% |                     |
| Monthly income    | < 5000 SR          | 212                              | 42.7% | 284 | 57.3% | .096                |
|                   | 5000-15000 SR      | 306                              | 48.3% | 327 | 51.7% |                     |
|                   | > 15000 SR         | 139                              | 42.5% | 188 | 57.5% |                     |

|   |                       |     |       |     |       |       |
|---|-----------------------|-----|-------|-----|-------|-------|
| Smoking   | Current smoker        | 95  | 52.2% | 87  | 47.8% | .122  |
|   | Ex-smoker             | 35  | 44.3% | 44  | 55.7% |       |
|   | Non-smoker            | 527 | 44.1% | 668 | 55.9% |       |
| Work section  | Not working / student | 190 | 43.7% | 245 | 56.3% | .007* |
|   | Healthcare sector     | 159 | 39.8% | 241 | 60.3% |       |
|   | Non-healthcare sector | 308 | 49.6% | 313 | 50.4% |       |
| Do you think there are negative effects of using decongestants for a long time? | Yes                   | 540 | 43.4% | 703 | 56.6% | .002* |
|   | No                    | 117 | 54.9% | 96  | 45.1% |       |

**TABLE 3: Factors associated with nasal decongestant use among study participants in Saudi Arabia**

P: Pearson's X<sup>2</sup> test; \$: Exact probability test; \* P < 0.05 (significant); SR: Saudi Riyal

Table 4 shows the factors associated with the side effects/complications of nasal decongestants among study participants in Saudi Arabia. Complications were reported among all cases who had NDC by themselves without a prescription versus 91.4% of others who used it through physician advice (P=.049). Also, 93.3% of those who consume two bottles of NDC per month developed complications compared to 55.6% of those who used three bottles (P=.001).

| NDC use                                | Are you diagnosed with any complications by a physician? |       |     |        | p-value             |
|--|--|-------|-----|--------|---------------------|
|  | Yes  |       | No  |        |                     |
|  | No   | %     | No  | %      |                     |
| Duration of using decongestant         |  |       |     |        |                     |
| < 5 days                               | 30   | 6.5%  | 435 | 93.5%  | .149                |
| 5-15 days                              | 11   | 12.4% | 78  | 87.6%  |                     |
| 15-30 days                             | 1  | 4.2%  | 23  | 95.8%  |                     |
| 2-6 months                             | 1  | 7.1%  | 13  | 92.9%  |                     |
| 7-12 months                            | 3  | 18.8% | 13  | 81.3%  |                     |
| 2-5 years                              | 2  | 12.5% | 14  | 87.5%  |                     |
| > 5 years                              | 5  | 15.2% | 28  | 84.8%  |                     |
| Frequency of using decongestants / day |  |       |     |        |                     |
| 1 time / day                           | 12   | 10.0% | 108 | 90.0%  | .161                |
| 2 times / day                          | 17   | 6.3%  | 253 | 93.7%  |                     |
| 3 times / day                          | 9  | 6.0%  | 141 | 94.0%  |                     |
| 4 times / day                          | 3  | 21.4% | 11  | 78.6%  |                     |
| 5 or more / day                        | 2  | 14.3% | 12  | 85.7%  |                     |
| Only with symptoms                     | 10   | 11.2% | 79  | 88.8%  |                     |
| NDC was recommended by                 |  |       |     |        |                     |
| Physician                              | 31   | 8.6%  | 329 | 91.4%  | .048* <sup>\$</sup> |
| Pharmacist                             | 9  | 6.5%  | 129 | 93.5%  |                     |
| Family                                 | 6  | 7.1%  | 78  | 92.9%  |                     |
| Friends                                | 2  | 7.1%  | 26  | 92.9%  |                     |
| My self                                | 0  | 0.0%  | 25  | 100.0% |                     |
| Internet                               | 5  | 22.7% | 17  | 77.3%  |                     |
| How many bottles are used per month?   |  |       |     |        |                     |
| One                                    | 43   | 7.3%  | 546 | 92.7%  | .001* <sup>\$</sup> |
| Two                                    | 3  | 6.7%  | 42  | 93.3%  |                     |
| Three                                  | 4  | 44.4% | 5   | 55.6%  |                     |
| 4 / more                               | 3  | 21.4% | 11  | 78.6%  |                     |

**TABLE 4: Factors associated with the side effects/complications of nasal decongestant among study participants in Saudi Arabia**

P: Pearson X2 test; \$: Exact probability test; \* P < 0.05 (significant); NDC: nasal decongestant

### Discussion

Nasal congestion use patterns and epidemiology are not properly studied in the general population and the majority of congestion-related studies were among patients with diagnosed rhinologic disorders. The most reported cause of nasal congestion is allergic rhinitis [13,14]. Globally, the prevalence of allergic rhinitis-related congestion showed an upward trend [15,16]. Nasal decongestant drugs are extensively used in rhinology with reported practice among the general population. Topical nasal decongestants are available as



over-the-counter drugs. Nasal decongestant medications, including alpha-adrenergic agonists like oxymetazoline, xylometazoline, phenylephrine hydrochloride, pseudoephedrine, naphazoline hydrochloride, tetrahydrozoline hydrochloride, clomazone, tramazoline, hydroxy amphetamine, tuaminoheptane, and phenylpropanolamine, are sympathomimetic factors that emulate sympathetic central nervous system activity in the body [17,18].

The current study aimed to assess the frequency of using nasal decongestants among the general population in Saudi Arabia and to identify the pattern of use and the factors influencing the long-term use of nasal decongestants. The majority of the participants (more than three-quarters) were non-smokers while about three-quarters of the smokers used one to two packs daily. Also, the study revealed that more than three-quarters (85%) of the study participants thought there are negative effects of using decongestants for a long time, and more than half of them (59%) reported that the recommended duration for using decongestants is three to five days. Topical nasal decongestants recommended that the duration of use should not exceed five days [17], as rebound congestion is the common side effect reported due to the misuse of nasal decongestant medications, particularly in their topical agents [19]. Globally, some countries recommended the use of decongestion drugs is limited to a maximum of 10 days because of the risk of developing rhinitis medicamentosa [20].

Regarding the prevalence of using nasal decongestants among the general population in Saudi Arabia, the study showed that less than half of the participants (45.1%) reported using nasal decongestants. It was used for less than five days among about 70% of participants and less than half of them used it two times daily. About three-quarters of the users reported using Otrivin (local decongestant), but much fewer cases used Xylomet and Apihist. Nasal obstruction was the main cause of using NDC (among two-thirds of the users), where one-fourth of them used NDC for the common cold, and this explains why topical agents were most used. The physician was the main prescriber for using NDC (among more than half of the users) while one-fifth of the cases were advised by pharmacists. The study also showed that two-thirds of the users received advice on how to use NDC and the vast majority of them experienced an improvement in the symptoms, whereas less than 10% had complications due to NDC use. Alyahya KA et al. reported that 68.5% of Saudi adults had used nasal decongestants, whereas 66.5% had used them with a prescription and 31.5% without a prescription [21]. Yoo JK et al. found that four (40%) volunteers had a history of allergic rhinitis and 2 (20%) used topical nasal steroids [18]. Aljibori AS assessed 300 patients (150 male, 150 female) with full history-taking and complete nasal examination [22]. About 13.3% were complaining of rhinitis medicamentosa. A total of five patients (12.5%) used nasal decongestants for two weeks, 15 patients (37.5%) used the medications for four weeks, and 20 patients (50%) used them for more than six weeks. Lenz D et al. reported that about 71.8% of university students had already used topic nasal decongestants, 64.3% had used this medication for at least 15 days, and 64.6% had started using it due to nasal obstruction [17]. Also, the pharmacist was the main health professional who provided patients with guidance on how to use this medication. Regarding the associated benefits and complications of NDC use, Taverner D conducted a systematic review and concluded a small but statistically significant reduction of 6% in subjective symptoms after a single dose of decongestant compared with a placebo [23]. Additionally, there was a decrease in nasal airway resistance. With repeated doses, nasal decongestants caused a very small statistical benefit of 4% over three to five days with a decrease in nasal airway resistance. Two studies revealed relatively few adverse events and only a small increased risk of insomnia with pseudoephedrine compared to placebo.

The strengths of our study include the large sample size, diversity, and national distribution of participation. Our limitations include the electronically distributed questionnaire.

## Conclusions

In conclusion, the study revealed that the frequency of using nasal decongestants was common (45.1%) in the participants. The main cause of use was nasal obstruction. Nasal decongestants were mainly used for less than five days, which is the most recommended duration to avoid adverse events. Health care staff (physicians and pharmacists) had a major role in advising the use of nasal decongestants with a high improvement rate in symptoms and low experienced side effects. More efforts should be paid to improve public awareness regarding indications, duration of use, and method of using nasal decongestants to avoid rebound reactions that may affect the patients' daily life activities.

## Additional Information

### Disclosures

**Human subjects:** Consent was obtained or waived by all participants in this study. HAP-02-T-067 issued approval 589. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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