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INVESTIGATING THE EFFECT OF HOME FRAGRANCE AUTOSPRAYS ON INDOOR AIR QUALITY AND HUMAN HEALTH

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The widespread use of fragrance autosprays in residential and commercial spaces has raised concerns about their impact on indoor air quality and human health. This study aimed to explore the health implications, usage patterns, and awareness of potential risks associated with fragrance autosprays among 113 participants. The survey examined demographic factors, motivations for use, and perceived effects on air quality and health. Results revealed that 56.8% of participants regularly used fragrance autosprays, with the primary motivations being ambiance enhancement (71.2%) and odor masking (33.3%). However, negative health outcomes were frequently reported, including allergic reactions (58%), respiratory irritation (56%), and headaches or migraines (43%). Despite these risks, 36.9% of respondents believed that autosprays improved indoor air quality, while awareness of chemical risks remained moderate. Encouragingly, 82.9% expressed a willingness to switch to natural or eco-friendly alternatives. Additionally, there was notable interest in the creation of environmental policies aimed at limiting the use of fragrance autosprays or implementing fragrance-free zones in public and workspaces. This study underscores the need for improved product transparency, consumer education, and the development of safer, sustainable fragrance solutions to mitigate health and environmental risks.

Keywords: Indoor pollution, Volatile organic compounds (VOCs), Environmental policies, Public health impact.

1 INTRODUCTION

Maintaining good indoor air quality (IAQ) is vital for human health and well-being, particularly as modern lifestyles and urbanization have led to people spending more time indoors. Whether at home, in offices, restaurants, theaters, or stores, individuals are continuously exposed to indoor air pollutants that can impact their health (Mannan and Al-Ghamdi 2021). However, the growing popularity of fragrance autosprays in homes and commercial spaces has sparked concerns about their effects on indoor air quality and potential health risks (Son 2024). These products, often marketed as enhancing ambiance and eliminating odors, release a complex mixture of volatile organic compounds (VOCs) and other chemicals into indoor environments (Kim *et al.* 2015). While they may create a pleasant atmosphere, their long-term effects on air quality and human health remain a growing concern.

Research suggests that exposure to fragrance emissions may elevate levels of terpenes, such as xylene, along with other volatile compounds like aldehydes and esters, potentially triggering adverse health effects, including sensory irritation, respiratory issues, and lung dysfunction (Kim

et al. 2015). Despite these risks, many consumers continue to use fragrance autosprays, often unaware of the potential dangers associated with their chemical compositions (ArgaamPlus 2024). Moreover, regulatory measures surrounding the use and labeling of fragrance products remain limited, leaving gaps in consumer knowledge and product transparency. This study aims to investigate the effects of home fragrance autosprays on IAQ and human health by examining usage patterns, perceived health impacts, and awareness of associated risks. By exploring consumer behavior and health outcomes, this research seeks to provide valuable insights into the need for safer fragrance alternatives, improved product regulations, and increased public awareness.

2 LITERATURE REVIEW

2.1 Indoor Air Quality (IAQ)

Indoor air quality (IAQ) is a critical factor in human health and well-being. Indoor pollutants such as volatile organic compounds (VOCs), particulate matter, carbon monoxide, and microbial contaminants can significantly impact human health (Maung *et al.* 2022). Exposure to these pollutants has been associated with upper respiratory irritation, asthma symptoms, and an increased risk of cancer (Maung *et al.* 2022).

Studies on air pollution have traditionally centered on outdoor environments, with indoor air quality (IAQ) receiving limited attention until the past decade (Sundell 2004). In recent years, growing scientific evidence has highlighted that indoor air is often more polluted than outdoor air, prompting increased concern from both researchers and the public regarding the potential health risks associated with IAQ (EPA 2013). As lifestyles and building materials continue to evolve, the composition and characteristics of indoor air pollutants have become increasingly complex, presenting new challenges that require thorough examination.

2.2 Fragrance Autosprays

Due to inadequate ventilation, the lack of proper air conditioning systems, human activities, and cooking odors, people increasingly rely on air fresheners and fragrance autosprays in homes and commercial spaces, raising concerns about their impact on indoor air quality and potential health risks (Mannan and Al-Ghamdi 2021, Son 2024). The GCC perfume market is projected to grow at a compound annual growth rate (CAGR) of 8.7% from 2022 to 2027, reaching SAR 20.4 billion by the end of the period. Among the GCC countries, Saudi Arabia is expected to be the largest contributor, with a CAGR of 13% over the next five years. Fragrance autosprays, which are increasingly used in both residential and commercial spaces for their convenience and ability to enhance the ambiance, are a significant part of this growth (ArgaamPlus 2024).

2.3 Health Impact

As the use of fragrance autosprays becomes more prevalent, concerns have emerged regarding their potential to contribute to indoor air pollution. These products often release volatile organic compounds (VOCs), such as terpenes, aldehydes, and esters, which can negatively impact air quality (Kim *et al*. 2015). While fragrance autosprays are designed to mask unpleasant odors and create a more pleasant environment, studies have raised alarms about the possible health risks associated with prolonged exposure to these chemicals (Kim *et al.* 2015). Respiratory irritation, allergies, headaches, and other health issues have been linked to the use of air fresheners, particularly in poorly ventilated spaces (Kim *et al.* 2015).

As demand for fragrance autosprays grows, it is essential to better understand their impact on both indoor air quality and human health, as well as to promote safer, more sustainable alternatives.

This study aims to bridge this gap by examining usage patterns, awareness levels, and perceived health effects associated with fragrance autosprays, providing valuable insights for policymakers, consumers, and manufacturers.

3 METHODOLOGY

This study aims to investigate the impact of fragrance autosprays on indoor air quality (IAQ) and human health, focusing on usage patterns, health effects, and consumer awareness. The research will be conducted through quantitative method, as outlined below:

3.1 Method Design and Structure

The study adopted a quantitative approach to investigate the impact of fragrance autosprays on indoor air quality (IAQ) and human health, focusing on usage patterns, health effects, and consumer awareness. Researchers executed a web-based survey, which was adopted by Creswell and Clark (2017).

3.2 Data Collection

The authors collected data through an online questionnaire that targeted a sample of 113 participants, including individuals who regularly use fragrance autosprays in both residential and commercial spaces. The survey aimed to gather information on demographic factors, frequency and types of fragrance autospray usage, perceived health effects, and participants' awareness of potential IAQ risks.

The survey instrument consisted of a total of 31 questions organized into distinct sections to comprehensively explore the impact of automatic home air fresheners. The demographic section included 5 questions covering age, gender, living environment, household size, and monthly spending on air fresheners. The usage patterns section contained 7 questions addressing frequency, reasons, locations, and types of automatic air fresheners used. Perceptions and health-related concerns were examined through 13 questions, including symptom ratings and ventilation habits. Finally, attitudes towards safety and alternatives were assessed with 6 questions, including awareness, reading labels, and suggestions for improvements. This structured approach enabled a thorough understanding of participants' behaviors, perceptions, and health experiences related to automatic air fresheners.

The survey was distributed electronically via online platforms such as Google Forms and social media, ensuring wide accessibility. Participants were recruited through purposive sampling via online platforms, targeting individuals who regularly use automatic fragrance autosprays in residential and commercial environments. This approach ensured that respondents had direct experience with the specific type of air freshener under study, minimizing confusion with other air freshener products. To account for potential pre-existing health conditions that could influence reported symptoms, the survey included screening questions about participants' history of respiratory issues or allergies. This screening helped differentiate symptoms related to prior conditions from those potentially caused by exposure to aerosol fragrances, thereby improving the accuracy and validity of the collected data.

The survey was distributed across major cities in Saudi Arabia, including Riyadh, Jeddah, Dammam, Abha, and Tabuk. Approximately 62% of respondents were from Riyadh, 20% from Jeddah, with the remaining participants spread among Dammam, Abha, and Tabuk. This geographic distribution provides a diverse representation of climatic conditions—from the hot, arid climate of Riyadh to the milder, coastal climate of Jeddah—allowing for a more comprehensive

understanding of how environmental factors may influence respondents' perceptions of aerosol fragrances.

3.3 Data Analysis

To evaluate the reliability and validity of the survey, Cronbach's alpha was calculated to assess the internal consistency of the data. The survey's overall Cronbach's alpha was found to be 0.78, exceeding the acceptable threshold of 0.7, indicating strong internal consistency (Sheather 2009). This result implies that the survey items consistently measured the intended constructs, thereby strengthening the credibility of the findings. The collected data were processed using statistical software, including cleaning and modeling. Descriptive analysis was conducted to identify patterns and relationships between variables. The findings relevant to this study are presented in the Results section.

4 RESULTS

The first section of the survey covered demographic information. The survey included participants from various age groups, with the majority falling between 25 and 34 years old (31%), followed by 35 to 44 years old (27.3%). Younger respondents aged 18 to 24 made up 24.7%, while those aged 45 to 54 accounted for 15%, and only 2% were 55 or older. In terms of gender distribution, 51.3% of respondents were male, and 46.9% were female. Most participants resided in urban areas (87.6%), while 9.7% lived in suburban environments, and 2.7% were from rural areas. Participants were asked about their frequency of fragrance autospray use. The results showed that 22.1% used them daily, 27.4% used them multiple times a week, 37.2% used them once a week, and 13.3% reported not using them at all. Most participants indicated that they use fragrance autosprays primarily in their homes, offices, or cars, highlighting these spaces as the most common environments for exposure. Figure 1 presents the reasons why participants use fragrance autosprays.

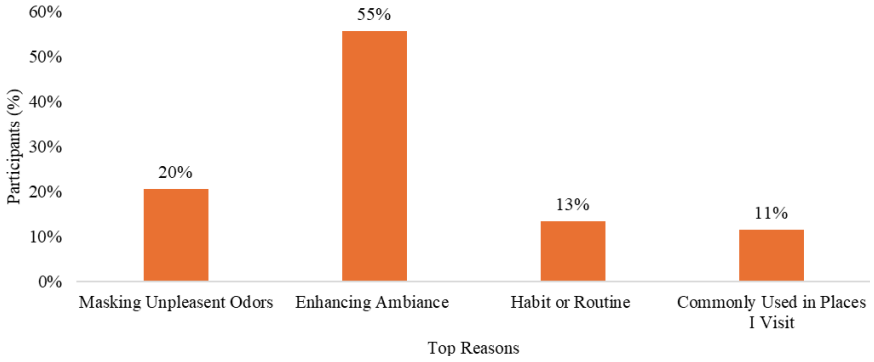

Figure 1. Primary reasons why participants using fragrance autosprays.

Most participants reported using fragrance autosprays primarily to enhance ambiance (55.4%) and mask unpleasant odors (20.3%). Additionally, some participants indicated that their usage was driven by habit or routine (13.1%), while others used them because they were commonly used in places they visited (11.2%). Participants were asked about the specific locations where they use fragrance autosprays. The majority of participants reported using fragrance autosprays in the living room (68.1%), followed by the workplace (38.1%), bedroom (28.3%), car (28.3%), bathroom (27.4%), and kitchen (25.7%). 51% of the participants reported that they rarely use ventilation

when using fragrance autosprays. Moreover, 41% expressed concerns about the potential health effects associated with their use. Figure 2 presents the participants' responses regarding the symptoms they experience after using, being exposed to, or inhaling perfumes from automatic sprays.

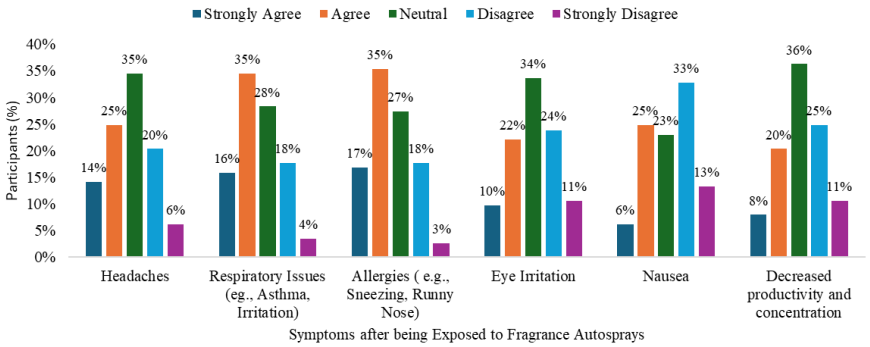

Figure 2. Symptoms after using, exposed to, or inhaling perfume from autosprays.

Most participants reported experiencing various symptoms after using or being exposed to fragrance autosprays. The most common symptoms were headaches (39%) and respiratory issues like asthma or irritation (51%). Allergies, such as sneezing or a runny nose, were reported by 52% of participants. Other symptoms included eye irritation (32%), nausea (31%), and decreased productivity or concentration (28%). Regarding consumer awareness and behavior, participants were asked whether they read ingredient labels or safety information when purchasing automatic perfumes. The results indicated that 60.2% of participants do not check this information, while only 39.8% do. Participants were asked whether they were aware that automatic perfume sprays contain chemicals that can affect indoor air quality and human health. The results showed that 57.5% of participants were aware of this, while 42.5% were not. Participants were asked if they would consider switching to natural or eco-friendly alternatives if available. The majority (82.3%) responded positively, indicating a strong preference for safer and more sustainable options.

5 DISCUSSIONS

The survey findings provide valuable insights into the usage patterns, health effects, and consumer awareness related to fragrance autosprays. The results highlight a widespread reliance on these products, with most participants using them regularly in indoor spaces such as homes, offices, and cars. Notably, the primary motivations for using fragrance autosprays were to enhance ambiance and mask unpleasant odors. However, a significant proportion of participants reported experiencing adverse health effects, suggesting potential risks associated with frequent exposure to these products.

One of the most concerning findings is that 51% of participants reported rarely using ventilation when using fragrance autosprays. This lack of proper airflow can lead to the accumulation of volatile organic compounds (VOCs) and other potentially harmful chemicals in indoor environments, exacerbating health risks. The high prevalence of reported symptoms, particularly respiratory issues and allergies, supports existing research indicating that fragrance chemicals can contribute to respiratory irritation and allergic reactions (Kim *et al.* 2015).

Despite these health concerns, the survey revealed limited consumer awareness of fragrance autospray ingredients. Over 60% of participants reported not reading labels or safety information before purchase, highlighting the need for clearer labeling and public education on potential risks.

Encouragingly, 82.3% expressed willingness to switch to natural or eco-friendly alternatives, indicating strong demand for safer products. This preference for sustainability presents an opportunity for manufacturers to develop and promote fragrances with fewer harmful chemicals while maintaining effectiveness.

6 CONCLUSIONS

The study found that fragrance autosprays are commonly used in indoor spaces to improve the atmosphere or cover unpleasant smells. However, many users reported negative health effects, such as breathing problems, allergies, headaches, and nausea. Using these products without proper ventilation increases the risk of indoor air pollution and exposure to harmful chemicals.

Additionally, the study showed that many consumers do not check labels or safety information before buying these products. Despite this, there is strong interest in switching to natural or eco-friendly alternatives, pointing to a chance to promote safer options in the market.

These findings highlight the need for better public awareness, clearer product labeling, and improved ventilation to reduce health risks. Further research is needed to assess the long-term effects of fragrance autosprays on air quality and health, along with advocacy for safer, more sustainable alternatives. This study relied on self-reported data and lacked controlled experimental conditions, meaning some reported symptoms may be due to pre-existing health issues.

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