

Health care Providers' Knowledge and Adherence to the National Guidelines for Management of Paediatric Asthma in Najran Region, Saudi Arabia

Hamad S. Alyami¹, Mohamed A.A. Orabi^{1,2}, Fahad J. Almakhalas³, Jaber S. Alyami⁴

¹Department of Pharmaceutics, College of Pharmacy, Najran University, Najran, Saudi Arabia

²Faculty of Pharmacy, Al-Azhar University, Assiut, Egypt

³Department of Clinical Pharmacy, Riyadh Elm University, College of Pharmacy, Riyadh, Saudi Arabia

⁴Department of Dentistry, Assir Central Hospital, Assir Health Affairs, Abha, Saudi Arabia

*Corresponding author: Hamad Saleh Alyami

| Received: 15.03.2019 | Accepted: 25.03.2019 | Published: 31.03.2019

DOI: [10.21276/sjmps.2019.5.3.11](https://doi.org/10.21276/sjmps.2019.5.3.11)

Abstract

Objective: Introduction: Saudi initiative for asthma provides an updated framework for the diagnosis and management of asthma based on the best global scientific information. However, the prevalence of childhood asthma in Saudi has dramatically increased from 5% to 25% in the last decade. Objectives: To obtain information from health care providers (HCPs) regarding their knowledge, attitudes and use of the national guidelines for diagnosis and management of the childhood asthma. Methods: The study consisted of mixed surveys [semi-structured interviews (phase 1) and online survey (phase 2)] of the HCPs (paediatric doctors, pharmacists and nurses) whom work at hospital and primary care centres in Najran region, Saudi Arabia. The surveys assessed the knowledge and adherence of the HCPs to the national care pathway. Results: The paediatric doctor's interviews afforded that the main barriers to adherence to guidelines are the lack of awareness and resources. In the online surveys, of the 535 HCPs, 172 surveys were completed. Of these, 48% of the respondents reported being aware to children asthma guidelines. 42% of the respondents did not follow any paediatric asthma guidelines. More than half of respondents (51.7%) follow guidelines for the paediatric asthma diagnosis. The most common barrier for adherence to asthma guidelines were lack of awareness (40%), followed by patient non-compliance with clinical management plan, lack of resources, difficult to understand the guidelines and the lack of time (32%), (16%), (7%) and (4%), respectively. Vast majority of respondents (75%) didn't attend any training courses regarding awareness with asthma diagnosis and management. The study also revealed that dust mites and air pollution are the most popular asthma triggers (38%). 43% of respondents strongly agreed that a Saudi gene may be responsible for asthma. Most of the participants are not familiar with the number of children were admitted to Hospitals in the last twelve months. Conclusions: The results support that HCPs need education regarding diagnosis and clinical management plans of asthma by attending courses and workshops. Establishment of an asthma care centre may improve awareness and identify in depth the effective pathways for rapid asthma diagnosis.

Keywords: Asthma, diagnosis and management, paediatric doctor's.

Copyright @ 2019: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and source are credited.

INTRODUCTION

Asthma is a long-term chronic inflammatory disease of the respiratory system including the airways and lungs. It characterized by air flow obstruction and bronchospasms that may lead to breath shortness, chest tightness, coughing and wheezing which may occur several times a day or as weekly episode [1]. These symptoms are individual dependent and become more intense at night-time or physical activities [2]. Asthma flare-up sometimes needs immediate ambulatory intervention as it may be fatal.

Asthma has been substantially prevailed from as little as 8 % in the year 1986 to as much as 25% in

2001 and are progressively increasing with time [3]. A global report in the year 2015 estimated that up to 358 million people had asthma compared with 183 million in 1990, with a death toll of about 397,100 deaths in 2001, mostly from the developing world [4]. Eliminating asthma causal factors can reduce the episodes in most patients, however, asthma is not curable disease. Many factors including delay in diagnosis, patient's noncompliance with their prescribed medication and patient's inappropriate medication use such as inhaler devices are recognized as potential causes of morbidity and mortality in asthmatic patients [5]. Many attempts to produce guidelines for effective diagnosis and treatment have

reported [6]. Criticized argument about asthma guidelines implementation in clinical practice is the oversimplifying of the medical decision with restriction to individualize patients' health caring and the constriction of physicians and other HCPs to act according to their previous experiences [7]. However, implementation of asthma protocol guidelines (ASPGs) were found useful in the national and international health care settings as it emphasize the appropriate use of treatment and preventative medication together with the routine measurement of lung function [8]. Implementation of ASPGs in hospital emergency departments has reduced the time of stay and minimized the costs without an increased rate of readmission [9]. ASPGs also aimed to minimize chronic asthma symptoms that impair normal patients' activity and regular exercise, prevent recurrent disease exacerbations, minimize the need for emergency care unit or hospitalizations, and maintain normal pulmonary function [10]. The ASPGs give optimal pharmacotherapy with least adverse effects that meet patients' and families' positive expectations with asthma care [11].

The Saudi initiative for asthma (SINA) has been released in the year 1995 to simplify the practices of asthma management and to improve its medical care quality [12]. To the best of our knowledge there is no prior studies assessed the adherence of concerned healthcare maven working in Najran Hospitals to the national asthma guidelines.

The present study assesses HCPs adherence to the asthma guidelines and evaluate their knowledge, attitudes and practices toward Asthma diagnosis and management. The study also pointed out the demand to the asthma care centres in Najran region.

Methods

Overall methodological design of the study

The study consisted of multi-sites, cross-sectional two phases surveys: Phase 1; a variety of semi-structured interviews were performed between July and August 2018. This preliminary scoping work was used to develop the online survey (phase 2). The latter survey was conducted using an anonymised electronic survey (BOS).

Population and Setting

The study was conducted with Najran hospitals and primary care centres based on paediatric doctors, pharmacists and nurses working at the following hospitals: Maternity and Children Hospital (MCH, phases 1 and 2), King Khalid Hospital (phase 2), Hubuna General Hospital (Phase 2), New Najran General Hospital (phase 2) and other small hospitals and primary care centres distributed at many localities of Najran region.

Recruitment and consent

Phase 1: A minimum of three participants from each of the three professional groups were recruited to the study by recommendation from the research leads or via their involvement in the academic practice unit at MCH. All potential participants received a participant information sheet and those recruited to the study completed and signed the relevant consent form. The data collected were analysed using framework analysis [6] with the following stages: Data entry and processing, familiarisation of the interview data, collecting and identifying an initial framework based on the question guide. Coding and indexing the interviews using NVIVO 11 (Table 1), generation of themes or charting according to the themes. Finally, mapping and interpretation. Verbatim transcripts were produced in Microsoft office word 2013 from the digital audio-recordings, hence, semi-structured interviews provided 12,255 words of text. Participants were anonymously assigned a coded identifier within the text (e.g. speaker 1, speaker 2 etc.) to ensure the extent to which the views shared could not be identified. The verbatim text was copied into a qualitative data analysis and coding software (Qualitative research software, QRS NVivo 11), which was used to arrange information and combine analysis with linking [13]. A framework analysis approach was used to qualitatively analyse the data [14]. The data was coded using coding framework based on the question guide for the interviews and objectives of this study (Table 1). The initial 10 minutes (20%) of the transcript recording was coded independently by two investigators using the initial framework with NVivo Version 11 to assist with indexing the codes. The similarity and differences between the two coders were discussed and a final framework established. The coding framework was used to code the rest of the transcript. The interpretation of the results from the coding of the semi-structured interviews were conducted based on the objectives of the interviews.

Table-1: Codes for the semi-structured interviews

Main code	Sub codes (Nvivo nodes)
1. Prescribing/giving asthma medications to children	1.1 Yes 1.2 No 1.3 Not enough medications 1.4 Always giving nebulizers
2. Asthma guidelines	2.1 It is available but not follow 2.2 Not at all

	2.3 Shortages regarding paediatric asthma guidelines 2.4 Follow SINA 2.5 Follow global initiative for asthma (GINA) 2.6 Follow national asthma guidelines pocket (NAGP)
3. Asthma education	3.1 Yes, but not enough 3.2 We need it
4. Most common asthma triggers	4.1 Smoking 4.2 Dust mites especially in Najran region 4.3 Animal dander 4.4 Pollen
5. Barriers for adhering asthma guidelines	5.1 Lack of resources 5.2 Lack of time 5.3 Guidelines not clear
6. Paediatric asthma medications	6.1 Cortisone is not safe for children 6.2 Compliance is the big issue 6.3 Parents are responsible for medication 6.4 Need more education
7. Establishing asthma care centre in Najran	7.1 Yes, it's very important 7.2 We used to have one and closed for no reason 7.3 It's quite important for adults and children
8. Any comments or any recommendations	8.1 No, thanks 8.2 I like the idea 8.3 I think it's a novel idea for children 8.4 Family education is very important 8.5 Patient should be involved in care plan 8.6 Workshops should be conducted regarding awareness of asthma disease

Phase 2: The survey development was supported by the HCPs semi-structured interviews. HCPs working at the time of the study at Najran hospitals were invited to complete an online survey. Managing of this survey using purpose designed electronic survey software was consequently considered to be both deliverable, efficient and suitable to save researcher time, effort and offers cost saving advantages [15]. A draft survey was created on 20th August 2018 using Bristol online survey software (BOS). Several comments were received leading to changes in the survey instrument. The resulting second draft was sent to a small number of HCPs for comments and further changes were made.

Email addresses of HCPs were obtained from the site lead at Najran hospitals and he managed this process by reference to staffing lists and responses. The invitation to participate was sent from BOS to the directorate general of health affairs in Najran trust email addresses of the study cohort with a link to the survey.

Participants were advised that all data were held confidentially, and anonymity was assured. Responses were exported from Bristol survey into MS Excel 2013 and IBM SPSS version 23 for analysis and production of descriptive statistics.

Inclusion and exclusion criteria

Inclusion criteria include: Healthcare providers (Doctor, Nurse, and Pharmacist) at MCH, King Khalid hospital, Hubuna general hospital, New Najran general

hospital in addition to various other hospitals and primary care centres located in Najran region.

Exclusion criteria includes: General public, refusal of consent, unable to give consent and withdrawal of consent.

Ethical considerations

Ethical approval was obtained from School of life & health sciences ethics committee at Najran University. No study activity commenced until all approvals were granted. Participants were recruited following informed consent. The process for obtaining applicant informed consent was in accordance with the research ethics committee and guidance and good clinical practice. Participant information sheets and information governance certificate were provided. Data was accessed by the study team only who all hold contracts with the study sites and possess up to date information governance certificates. All responses were fully anonymised prior to analysis and all reports accommodated confidentiality requirements. Audio files from the semi-structured interviews were held on-site at MCH, within the secure area of the Academic Practice unit. Once transcripts were approved, original recordings were destroyed. Additionally, paper records (from the semi-structured interviews) were also kept within the secure area of the academic practice unit at MCH and were destroyed upon transcription of the interviews.

Statistical analysis

Results were transferred to SPSS version 23 and NVivo version 11 software for analysis to facilitate descriptive statistical analysis and framework analysis, respectively.

RESULTS AND DISCUSSION

The present study assesses HCPs adherence to the asthma guidelines. The HCPs selected to participate in this study were medical doctors, pharmacists and nurses. The rationale for selection of HCPs was to demonstrate the leading relationship among the medicine prescriber (doctors) through the dispenser (pharmacists) and lastly to the administrator (nurses). The findings are obtained from direct semi-structured interviews and an online survey.

Phase 1: Semi-structured Interviews

A total of 10 HCPs (4 doctors, 3 nurses and 3 pharmacists) were interviewed at MCH during the study period (12th–27th August 2018). Phase 1 findings proposed that the main barriers to adherence to guidelines are those associated with lack of awareness, resources and training on the national guidelines. However, lack of time was highlighted the least important by 80% of respondents. Overall, most of the respondents (85%) recommend that adherence to the asthma guidelines is a keystone in effective asthma management. Similar studies have also reported that adherence to national asthma guidelines can reduce outpatient and emergency visits by 56% and 90%, respectively, for the treatment of asthma [16, 17]. Recommendations from HCPs within phase 1 on how to improve adherence to guidelines are as follow: Afford more information to the HCPs regarding asthma

guidelines, familiarizes family about asthma triggers and treatment management, enhance the change of life style of some families to be suitable for their asthmatic patients, decrease the global environment pollens, provide clear guidelines in management of asthma to all hospital and finally special care centres should be established for implementing these recommendations.

Phase-2: An online survey

Of 535 online surveys, a total of 172 (32.15%) responses were completed. The survey contained of four sections. These were: Demographic data including participant gender and years of experience of working with asthma paediatric patient, opinions and adherences of the participant for various paediatric asthma guidelines, their recommendations concerning diagnosis of asthma and the importance of establishing asthma care centre and the participants' feedback about the survey.

Demographic data of the survey respondents

The classification of the participants according to their professions across the Najran region showed that the nurses had the highest percentage of participants (62%) followed by pharmacists (12%) and consultants (10%), respectively. Data analysis shows that the difference is significant as the *p*-value is <0.05.

The results also showed a significant difference ($p < 0.05$) among the different HCPs gender and years of experience. Most of the respondents were females (58.7%). Approximately more than one-third (36.63%) of the respondents have 6–10 years of experience (Fig. 1).

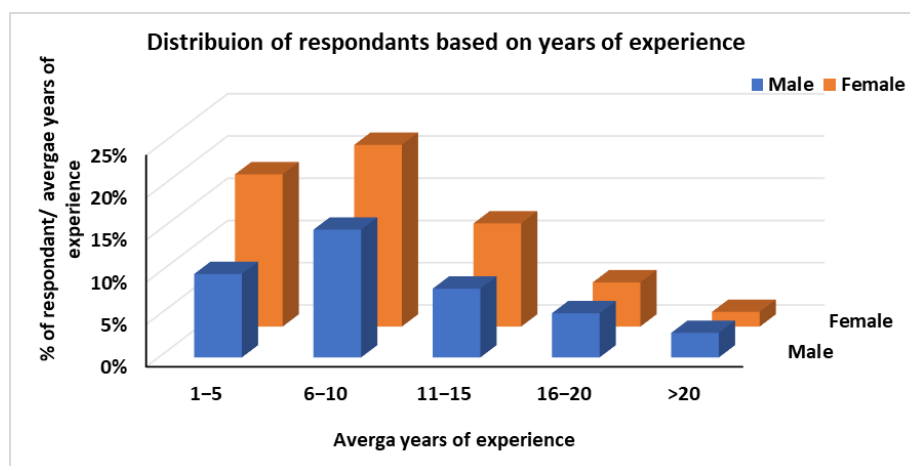


Fig-1: Respondents years of experience at the different hospitals and care centres

Healthcare providers' awareness of paediatric asthma guidelines

Asthma guidelines protocols are considered a tool for transforming evidence into practice. Guidelines are proposed to integrate evidence based guidelines into healthcare delivery and to improve the quality of patient

care [18]. The results showed that a total of 47.67% HCPs aware to children asthma guidelines, whereas 52.33% of participants are not aware to guidelines. Additionally, the asthma guidelines the respondents follow are SINA (27%), NAGP (17%) and GINA (12%). In turn 44% of respondents did not follow any

paediatric asthma guidelines, which probably due to the lack of awareness of the existence of asthma guidelines and the lack of knowledge about implementation of these guidelines to paediatric patient [5].

Implementing clear guidelines for diagnosis and clinical management of asthma may improve the medical care services administered to asthmatic paediatric patients, which may reduce attacks of asthma and hence the medical burden of asthma disease [19]. Although, the responses regarding implementation of guidelines for diagnosis of paediatric asthma revealed

that 51.74% follow the guidelines and 24.4% do not follow any guidelines for diagnosis of asthma. Worthy, the remains (23.8%) of the respondents stated that the answer of this question is not applicable due to their professions. A significant difference was found between those characters (mainly yes and no) ($p < 0.05$). About attendance of HCPs to workshops or courses regarding asthma education, vast majority of respondents (75%) didn't attend any training courses that demonstrate the importance of awareness and education of asthma disease (Fig. 2).

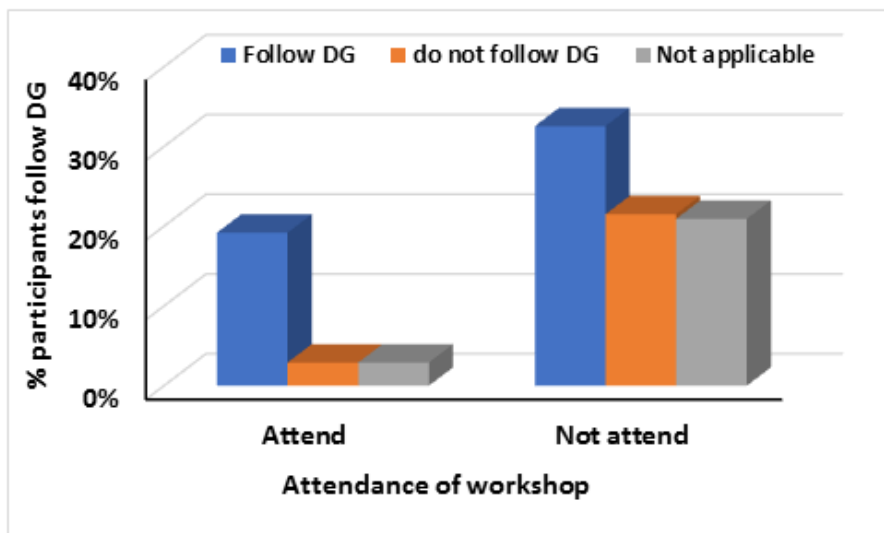


Fig-2: Details of respondents regarding diagnosis guidelines (DG) of asthma in children and total number of attendances to courses or workshops concerning asthma education

Barriers to adherence to asthma guidelines

The most common barrier for adherence to asthma guidelines revealed in this study is the lack of awareness (40%) followed by patient non-compliance with clinical management plan (32%), lack of resources (16%), incomprehensible guidelines (7%) and lack of time (4%). Probability values of 95% ($P < 0.05$) were set to define significant difference. Although the barriers to adherence to asthma guidelines is based on participants' perception which may not precisely detect which problematic barrier is, there is matching in the view that the lack of awareness persist the most common obstacle for adherence to the asthma guidelines followed by patient non-compliance and finally lack of resources [20].

HCPs responses regarding asthma medications

Considering asthma medications, few participants suggest that no matters with medication safety, but compliance is the big issue. They see that adherence to medication needs more efforts from HCPs to do good counselling with patients and their parents. Pharmacists indicated that medications such as inhaler is not safe for children. Also, very poor compliance and non-adherence to inhaler medication is a common therapeutic problem in paediatric patients with asthma.

Similar study cleared that the major reasons for non-adherence to medications include shortages of education, poor health knowledge and social fear of dependence on inhalers that usually prescribed during management of this chronic disease [21].

Participants also mentioned that the lack of knowledge and awareness to asthma guidelines may reduce compliance and adherence. Therefore, good counselling for patients and their relatives regarding awareness of this conditions through media or attending workshops in hospital may provide better compliance.

HCPs responses regarding asthma triggers, genetic factors, number of asthmatic children reported in a year and the relation between asthma and the gender

According to responses in this study, dust mites and air pollution are the most popular paediatric asthma triggers (38%), followed by smoking (20%). Animal dander and pollen are voted at the same percentage (19%), while medications such as Aspirin or NSAIDs was given the last probable trigger of asthma (4%). The asthma triggers data showed a statistically significant differences between dust mites and taking medications (one-way ANOVA, $p < 0.05$). Therefore, asthma triggers and strategies for controlling them

should be carefully addressed during the education programs.

Reliably, HCPs agreement toward the presence of specific genes in Saudi children responsible for asthma disease, approximately (43%) of respondents strongly agree whereas (11%) disagree (Fig. 3).

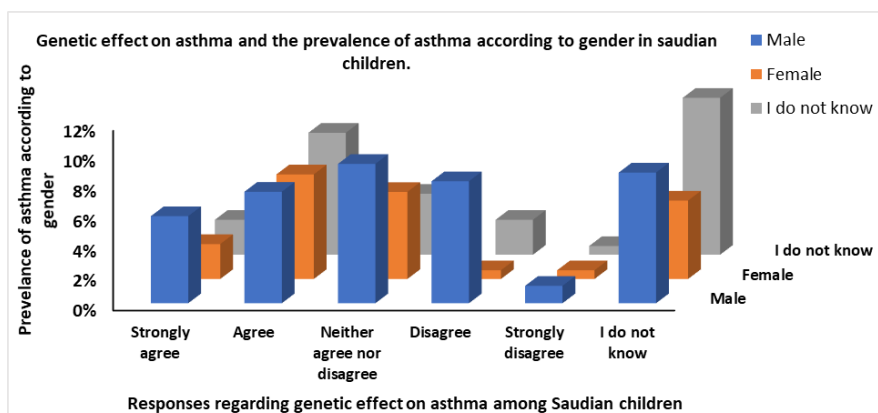


Fig-3: Distribution of total respondents' opinions regarding specific genes responsible for asthma disease in paediatric patients in Saudi and the participants views about prevalence of asthma according to gender

Responses about the number of asthmatic children whom admitted to hospitals over the last 12 months revealed confusion among the participants. Although 28% of the participants think that more than 10 children were admitted to hospitals due to severe asthma attack, 8% of the responses suggested 6–10 children, and around 7% said that only 1-5 children were hospitalised. Approximately 43% of the respondents, particularly nurses and pharmacists, have no idea about the number of children admitted to hospitals over the last year, while 15% of the respondents didn't report any admission of asthmatic children to the hospitals over the last year.

Half of the participants (50%) reported that asthma is more prevalent among male babies than female. There was a significant difference ($p < 0.05$) between child gender with respect to prevalence of asthma based on the participants observation. This is in line with findings from Gergen *et al.* who stated that asthma is higher among boys than girls [22].

Healthcare providers' recommendations regarding establishing of asthma care centres

Although the incidence of childhood asthma remains high. Barriers to effective asthma care that presently exist include the persistence of environmental risk factors, differences in care that stem from cultural differences and variations in the quality of asthma care provided by clinicians. Most of the respondents (88%)

mentioned that an establishing of asthma care centre is very important, and it may provide comprehensive, multidisciplinary care for children with asthma and related diseases and will enable management of difficult-to-control asthma, such as asthma amongst pregnant women. Similar study reported that establishment of an asthma centre may improve awareness and identify in depth asthma diagnosis [23]. Another study showed that a couples of services including community and specialty hospitals, a physician network, community health centres and home health and other health care entities are integrated in offering asthma patients a variety of coordinated and high-quality care [24]. In our study, the survey results show that improving awareness were the most popular service that should be provided to asthma patients (20%) followed by confirming diagnosis of asthma (18%), avoid long term use of high dose oral steroids (17%) and identification of asthma triggers (16%) (Fig. 4). Using one-way ANOVA, the results showed that the differences in services of asthma care centre were not significant ($p > 0.05$).

The participants recommendation regarding the providers whom should be involved to asthma care centre were pulmonologist (38%), followed by nurses (24%), pharmacist (20%) and immunologists (18%). Statistically, there was no significant difference among HCPs ($p > 0.05$) whom should belong to asthma centre.

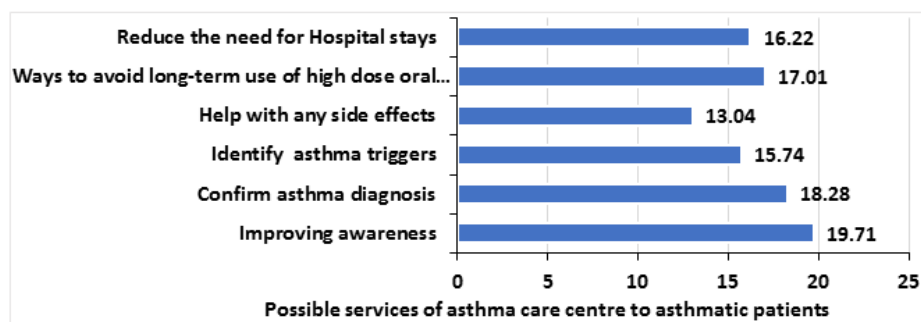


Fig-4: Participants opinions regarding distribution of services for asthma care centre to asthmatic patients

HCPs responses regarding asthma medications

Considering asthma medications, few participants suggest that no matters with medication safety, but compliance is the big issue. They see that adherence to medication needs more efforts from HCPs to do good counselling with patients and their parents. Pharmacists indicated that medications such as inhaler is not safe for children. Also, very poor compliance and non-adherence to inhaler medication is a common therapeutic problem in paediatric patients with asthma. Similar study cleared that the major reasons for non-adherence to medications include shortages of education, poor health knowledge and social fear of dependence on inhalers that usually prescribed during management of this chronic disease [21].

Participants also mentioned that the lack of knowledge and awareness to asthma guidelines may reduce compliance and adherence. Therefore, good counselling for patients and their relatives regarding awareness of this conditions through social media or attending workshops in hospital may provide better compliance.

Further recommendations, feedback and limitations

In the last section of the study, the HCPs were asked to give their opinions, recommendations and feedback on how the study was conducted. The vast majority of respondents designated that regardless of the fact that it was a good idea, there were areas that could be improved. For instance, they pointed out that most questions should be asked to paediatric patients and their parents, however this will be covered in the next project. In addition, some participants also indicated that there were important subject concerns on education, families' special mothers and female teenagers about medications that influence on children while pregnant and after also malnutrition. Regarding awareness and education, some participants pointed out that a comprehensive workshop is deemed necessary for awareness, education regarding the triggers of asthma. Therefore, all governmental and private sectors must work hand in hand so that there will be a good or better outcome. Participants also suggested that the centre should be implemented and plans to be carried out thus a chance for research in other modalities of treatment for curative treatment of asthma will be conducted.

Regarding the respondents in online survey (phase 2) that resulted into more than half of respondents (62%) nurses but less with the medical practitioner group and pharmacists. This may have led to under representation of doctors' and pharmacists' perspectives and contribution. Focus group method was designed to be conducted for this study, however, some HCPs from the same institution were known to each other, this might have been seen as a potential limitation as respondents may have been more willing to speak in a 'socially accepted' style (i.e. less honestly) [25]. The study was conducted at one region in the Saudi Arabia, thus it cannot be comprehensive and viewed as a countrywide perception, and further exploration in other countries is required.

CONCLUSION

This pragmatic study filled the research gap that existed through exploring such healthcare providers' views and recommendations of the assessing and the adherence to the national asthma guidelines using a mixed methods approach (semi-structured interviews and online survey). In summary, this study identified a plethora of recommendations and opinions for adhering to paediatric asthma guidelines, principally which guidelines are used and aware by HCPs. The results showed that male gender of asthma paediatric patient is the most prevalence of wheeze and asthma attacks compared to female. Dust mites and air pollution are the most popular triggers of asthma diseases followed by smoking, animal dander and pollen. In addition, the lack of awareness endures the most common barriers for adherence to the paediatric asthma guidelines followed by patient non-compliance with clinical management plan and lack of resources. More than half of respondents indicated that a specific gene in Saudi children suggested to cause asthma attacks for paediatric populations. According to HCPs views, the cortisone is not safe for children and parents should make sure that the medication should take with the right dose and effective way especially the inhaler dosage forms. Finally, vast majority of respondents agree that an establishment of asthma care centre in Najran region is important due to many services the centre can provide such as, improving awareness,

confirming asthma diagnosis and reducing the need for Hospital stays.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

REFERENCES

- Sharma, S. (2016). Association between Bronchial asthma and Allergic Rhinitis: A Cross-sectional Study. *International Multispecialty Journal of Health*, 2:32-37.
- Kim, K. H., Jahan, S. A., & Kabir, E. (2013). A review on human health perspective of air pollution with respect to allergies and asthma. *Environment international*, 59, 41-52.
- Al Frayh, A. R., Shakoor, Z., ElRab, M. G., & Hasnain, S. M. (2001). Increased prevalence of asthma in Saudi Arabia. *Annals of Allergy, Asthma & Immunology*, 86(3), 292-296.
- Feigin, V. L., Krishnamurthi, R. V., Parmar, P., Norrving, B., Mensah, G. A., Bennett, D. A., ... & Davis, S. (2015). Update on the global burden of ischemic and hemorrhagic stroke in 1990-2013: The GBD 2013 study.
- Al-Shimemeri, A., Al-Ghadeer, H., Giridhar, H., Al-Jahdali, H., Al-Moamary, M., Khan, J., ... & Al Wazzan, A. (2006). Impact of an extensive Asthma education campaign for physicians on their drug prescription practices. *Annals of Thoracic Medicine*, 1(1), 20.
- Chung, K. F. (2006). Phosphodiesterase inhibitors in airways disease. *European journal of pharmacology*, 533(1-3), 110-117.
- Formoso, G., Marata, A. M., & Magrini, N. (2007). Social marketing: should it be used to promote evidence-based health information?. *Social Science & Medicine*, 64(4), 949-953.
- Alotaibi, A., Perry, L., Gholizadeh, L., & Al-Ganmi, A. (2017). Incidence and prevalence rates of diabetes mellitus in Saudi Arabia: An overview. *Journal of Epidemiology and Global Health*, 7(4), 211-218.
- Quizon, A., A Colin, A., Pelosi, U., & A Rossi, G. (2012). Treatment of disorders characterized by reversible airway obstruction in childhood: Are anti-cholinergic agents the answer?. *Current pharmaceutical design*, 18(21), 3061-3085.
- Al-Moamary, M. S., Alhaider, S. A., Al-Hajjaj, M. S., Al-Ghobain, M. O., Idrees, M. M., Zeitouni, M. O., ... & Alorainy, H. S. (2012). The Saudi initiative for asthma-2012 update: guidelines for the diagnosis and management of asthma in adults and children. *Annals of thoracic medicine*, 7(4), 175.
- Green, F. H., Williams, D. J., James, A., McPhee, L. J., Mitchell, I., & Mauad, T. (2010). Increased myoepithelial cells of bronchial submucosal glands in fatal asthma. *Thorax*, 65(1), 32-38.
- Al-Moamary, M. S., Alhaider, S. A., Idrees, M. M., Al Ghobain, M. O., Zeitouni, M. O., Al-Harbi, A. S., ... & Al-Hajjaj, M. S. (2016). The Saudi Initiative for Asthma-2016 update: Guidelines for the diagnosis and management of asthma in adults and children. *Annals of thoracic medicine*, 11(1), 3.
- Gibbs, G. (2002). *Qualitative data analysis: Explorations with NVivo (Understanding social research)* (p. 100). Buckingham: Open University Press.
- Vos, T., Barber, R. M., Bell, B., Bertozzi-Villa, A., Biryukov, S., Bolliger, I., ... & Duan, L. (2015). Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, 386(9995), 743-800.
- Wright, K. B. (2005). Researching Internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal of computer-mediated communication*, 10(3), JCMC1034.
- Ortega, A. N., Gergen, P. J., Paltiel, A. D., Bauchner, H., Belanger, K. D., & Leaderer, B. P. (2002). Impact of site of care, race, and Hispanic ethnicity on medication use for childhood asthma. *Pediatrics*, 109(1), e1-e1.
- Cloutier, M. M., Wakefield, D. B., Sangeloty-Higgins, P., Delaronde, S., & Hall, C. B. (2006). Asthma guideline use by pediatricians in private practices and asthma morbidity. *Pediatrics*, 118(5), 1880-1887.
- Lai, C. K., Beasley, R., Crane, J., Foliaki, S., Shah, J., Weiland, S., & ISAAC Phase Three Study Group. (2009). Global variation in the prevalence and severity of asthma symptoms: phase three of the International Study of Asthma and Allergies in Childhood (ISAAC). *Thorax*, 64(6), 476-483.
- Masoli, M., Fabian, D., Holt, S., Beasley, R., & Global Initiative for Asthma (GINA) Program. (2004). The global burden of asthma: executive summary of the GINA Dissemination Committee report. *Allergy*, 59(5), 469-478.
- Alotaibi, G. S. (2013). How far are we from adhering to national asthma guidelines: The awareness factor. *Egyptian Journal of Ear, Nose, Throat and Allied Sciences*, 14(1), 1-6.
- Ahmad, H., Jabeen, N., Iqbal, S., Farooqi, R. J., & Ashraf, S. (2018). Adherence to inhaler medications in patients treated for Asthma and COPD. *Pakistan Journal of Chest Medicine*, 24(1), 17-20.
- Gergen, P. J., Mullally, D. I., & Evans, R. (1988). National survey of prevalence of asthma among children in the United States, 1976 to 1980. *Pediatrics*, 81(1), 1-7.
- Swartz, M. K., Banasiak, N. C., & Meadows-Oliver, M. (2005). Barriers to effective pediatric

- asthma care. *Journal of Pediatric Health Care*, 19(2), 71-79.
24. Tschudy, M. M., Sharfstein, J., Matsui, E., Barnes, C. S., Chacker, S., Codina, R., & Wedner, H. J. (2017). Something new in the air: Paying for community-based environmental approaches to asthma prevention and control. *Journal of Allergy and Clinical Immunology*, 140(5), 1244-1249.
25. Rabiee, F. (2004). Focus-group interview and data analysis. *Proceedings of the nutrition society*. 63(4), 655-660.