Original Article

Mothers' Knowledge and Attitude towards Childhood Immunization in Aseer Region, Southwestern Saudi Arabia

Ayed A. Shati[1]*, Saleh M. Alqahtani[1], Ali Alsuheel Asseri[1], Ahmad A. Alhanshani[1], Youssef A. Alqahtani[1], Ahmed O. Alshahrani[2], Mohammed A. AlFlan[2], Abdullah A. Al Aliyah[2], Mohammed S. Alamri[2]

Abstract

Background: Childhood vaccination is crucial for child safety and physical well-being. Despite immunization being essential, some parents, even those whose children were given most of the recommended vaccines, exhibit concerns or misperceptions about vaccination.

Objective: The objective of the study was to assess the knowledge and attitude of the mothers in Aseer region in Soudi Arabia, regarding childhood immunization and factors associated.

Methods: The cross-sectional study was conducted amongst study group comprising of 1058 mothers who have visited a primary health care center in Abha City, Saudi Arabia with at least one child aged six years during the study period from February 2018 to January 2019. The data collection was conducted through interviews and responses were recorded using a pretested structured questionnaire.

Results: The study revealed that 54% of the participants had good knowledge about childhood vaccination and 84% knew that vaccines save the children from infectious diseases. However, many mothers had poor knowledge about importance of combined vaccine and contraindications of child vaccination. Most of the mothers (93%) had a positive attitude towards most of the investigated items except early immunization and administration of multiple doses of the vaccine. Mothers who worked in the medical field and had a greater number of children were significantly associated with good knowledge regarding immunization.

Conclusions: The study revealed that more than half of the mothers were knowledgeable regarding vaccination and child immunization. We concluded that the widespread preventive vaccination system is understood to be a foundation of decent public health. [*Ethiop. J. Health Dev*. 2021;35(4):289-296]

Key words: attitude; knowledge, childhood immunization; mothers; Asser

Introduction

Public trust in immunization is an increasingly important global health issue Vaccinations produce a massive positive impact on the health of children. The lack of confidence in vaccines and immunization programs can lead to vaccine reluctance and refusal, risking disease outbreaks and challenging immunization goals in high- and low-income settings (2). Although vaccination has significantly decreased the load of many communicable diseases, some studies reported several side effects and adverse events related to vaccination. In addition to this, some medical professionals and researchers questioned the benefits of vaccines and were uncertain about whether they were still beneficial, and this may have had an impact on the parents' concerns and misconceptions that negatively affected their knowledge and attitudes toward their children's' vaccinations (3,5).

While various studies have contradicted these common misbeliefs and proved that there is no association between vaccination and certain conditions: the MMR (measles, mumps, and rubella) vaccine and autism or childhood diabetes; DTaP (diphtheria, tetanus, and pertussis) and exacerbation of bronchial asthma etc, it seems that negative attitude and hesitancy toward vaccination amongst parents still prevails (6). Vaccine hesitancy' is a concept used to describe anyone who is doubtful about vaccinations or who chooses to delay or refuse immunizations even when they are readily available. Many studies have shown that parental vaccine hesitancy has a negative impact on vaccine uptake rates (7, 8). As per the World Health Organization (WHO), vaccination is one of the supremely economical ways to sidestep diseases. Currently vaccine prevents two to three million deaths per year, and an additional 1.5 million could be avoided with improvement of the worldwide coverage of vaccinations. However, a positive attitude toward immunization is essential (1).

A nationwide survey of 1,500 American families revealed that, almost 3% rejected all vaccines and a further 19.4% were reluctant to use at least one of the vaccines (9, 10). In addition to this, various other studies reported that even parents whose children received the complete vaccination had questions and worries (5, 11, 12). Previous studies carried out in five European nations, including Norway, England, Spain, Sweden, and Poland are ported significant attitude differences. While some parents were hesitant many parents had confidence and a positive attitude regarding immunization programs. According to one Emirates-based study, this group of moms had an excellent prevalence of a positive attitude toward vaccines, and satisfaction with the service was high. Those who did not obtain information from health professionals, on the other hand, had less knowledge of childhood vaccines (12, 13).

In Saudi Arabia, the Expanded Program on Immunization (EPI) was implemented since 1984. The surveillance data shows a good overall vaccine uptake which has significantly reduced mortality and

[1*] Department of Child Health, College of Medicine, King Khalid University, Abha, Kingdom of Saudi Arabia. Corresponding Author Email: shatiayed@gmail.com, ORCID ID: 0000-0003-0444-5595

[2] College of Medicine, King Khalid University, Abha, Kingdom of Saudi Arabia

morbidity among children from the target diseases (14). However, the challenge of an uneven vaccination uptake among its population, still exists. In this context, the lack of knowledge and awareness among Saudi parents is seen to have contributed to their negative attitude towards childhood immunizations (15, 16). The responsibility to vaccinate their children solely lies with the parents, especially the mothers. Although various studies regarding this issue have been conducted in other regions of Saudi Arabia, there are no studies that have been conducted in the Aseer region. With infectious diseases emerging in Saudi Arabia, understanding mothers' attitudes, knowledge and perceptions towards vaccination is essential. Therefore, this study aims to assess the mothers' knowledge; attitude and childhood vaccination practice in order gain a more in-depth understanding of the barriers in childhood vaccinations in Abha. Moreover, there is very limited resources and existing literature in the context of Saudi Arabia 16 regarding such an important topic. Therefore, it is expected that this study will enrich the existing nationwide knowledge which may guide the government and policymakers to develop versatile fact-based policies for the well-being of future generations.

Methodology

Study design, setting and participants

This is a descriptive cross-sectional survey conducted among mothers who had at least one child aged six years or less. A convenience sample included 1,058 mothers who visited primary health care centers in Abha City during a one-year period (from February 2018 to January 2019).

Study instrument and data collection

An interview questionnaire was developed by a panel that comprised of professors from family medicine and pediatrics, subject specialists. The paneled experts reviewed similar research materials and customized the questionnaires for this study. They also assessed the content validity of the instrument and approved its application. The Cronbach's alpha was high (0.89), showing the internal validity of the questionnaire. The questionnaire comprised questions about knowledge, attitudes, and practices of the mothers regarding childhood immunization and their socio-demographic background. A total of nine close-ended questions regarding knowledge were included in the questionnaire and the responses were recorded as "Yes", "No" and "Don't know". A three point-Likert scale ("agree", "Disagree", and not sure) was used to assess the mother's attitudes towards childhood immunization and a total eight questions about attitude were included in the questionnaire.

This study was conducted in accordance with the Declaration of Helsinki. Firstly, a verbal consent was taken from the participants and an explanation was given about the purpose of the study. This research was conducted with full consent of the participants and ensured confidentiality of the information shared. The data was collected by researchers through direct interviews with the mothers. The study was approved by the Research and Ethical Committee (REC# 2019-01-28) of the college of Medicine, King Khalid University.

Data analysis

Data were entered and analyzed using the Statistical Package for Social Sciences (IBM-SPSS ver.20). The Level of knowledge was assessed after scoring the responses by assigning, '1' for correct responses, '0' for incorrect and "do not know response; the score ranged from 0 to 9 points. All discrete scores for the knowledge items were added and the overall score was categorized as "poor" for those who scored less than 60% and "good" for those with a score of 60% or more. The research applied descriptive and inferential statistics. Descriptive analysis based on frequency and percentage was done for all variables including the knowledge and attitude items. Univariant relations between the mothers' socio-demographic characteristics and their knowledge were tested using Pearson's chi-square test at 0.05 level of significance**.**

Results

The total sample included 1,058 mothers, ranging from 18 to 55 years old, with a mean age of 35.6±10.2 years. About (98.6%) participants were Saudi and 69.6% were university graduates. About 62.2% of the mothers had a monthly family income of more than 10,000 SR (Saudi Riyals). About 38% of the mothers had 2-4 children, while 12.5% had seven children or more. and 12.7% were working in the medical field (Table 1).

Table 1: **Biodemographic data of sampled mothers in Abha City, Aseer region, Saudi Arabia, 2018-19**

Mothers' knowledge about childhood immunization	Correct		Incorrect		Do not know	
	N	%	N	%	N	%
Immunization keeps the children healthy	895	84.7%	38	3.6%	124	11.7%
Research recommends that vaccines for child immunization are safe	794	75.0%	49	4.6%	215	20.3%
Most vaccines prevent infectious diseases in the 1st year of a child's life	778	73.5%	47	4.4%	233	22.0%
It is important to vaccinate children during immunization campaigns	830	78.4%	105	9.9%	123	11.6%
Vaccines give effective immunity, the same as exposure to the real illness	665	62.9%	101	9.5%	292	27.6%
It is recommended to vaccinate children against seasonal influenza	362	34.2%	433	40.9%	263	24.9%
Currently used combined vaccines are safe	421	39.8%	73	6.9%	564	53.3%
Currently used combined vaccines are as effective as single vaccines	301	28.4%	80	7.6%	677	64.0%
Common colds, ear infections, and diarrhea are not contraindications for vaccination	266	25.1%	406	38.4%	386	36.5%

Table 2. Mother's knowledge about childhood immunization, Abha City, Aseer region, Saudi Arabia, 2018-19

Mothers' personal data		N	%
Age in years	18-25	75	7.1%
	26-35	367	34.7%
	36-45	377	35.6%
	46 and older	239	22.6%
Education level	Illiterate	12	1.1%
	Primary	26	2.5%
	Intermediate	42	4.0%
	Secondary	242	22.9%
	University	736	69.6%
Nationality	Saudi	1043	98.6%
	Non-Saudi	15	1.4%
Family monthly income (SR)	<5,000	83	7.8%
	5,001–10,000	317	30.0%
	10,001–15,000	323	30.5%
	15,001–20,000	335	31.7%
Number of children	One	176	16.6%
	2-4	388	36.7%
	5-6	362	34.2%
	7+	132	12.5%
Work in a health care field	Yes	134	12.7%
	No	924	87.3%

Mothers' knowledge about Childhood immunity

More than half of the participants (54.1%) had good level of knowledge regarding childhood vaccination (Figure 1). Eight four percent of the mother knew that the vaccines keep the children healthy out of which three-fourth of the mothers knew that research has found vaccines for child immunization to be safe. More than three quarters of the mothers (78.4%) approved about the importance of vaccinating their children during immunization campaigns. Regarding the knowledge of combined vaccine, 60.2% of the total respondents did not know that combined vaccines are safe and 71.6% of the respondents did not know that combined vaccines are as effective as single vaccines. Of the total parents 34.2% mothers knew that vaccine is recommended for protecting children against influenza. Almost 61.6% of the mothers either give incorrect answer (25.1%) or did not know (36.5%) that common colds, ear infection and diarrhea were not considered as contraindications for vaccination.

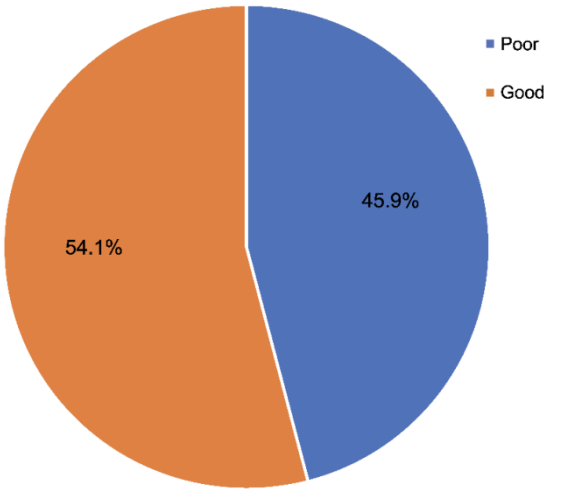

Figure 1: Level of knowledge of childhood immunization vaccination amongst the mothers in Abha City, Aseer region, Saudi Arabia, 2018-19

Attitude of the mothers towards childhood immunization

Table 3 presents mothers attitudes towards childhood immunization. The majority (93%) of the mother agreed that the vaccination is one of the most important rights of the child and that vaccinating is indicative of a parent's concern for their children's health. Of the respondents 81.4% agreed that immunization is more beneficial than harmful. Attitude towards early immunization and number of vaccinations, all most equal proportion of the mothers disagreed that "vaccination should not be performed too early" (44.1%) and "the number of vaccinations is too high and should be reduced" (42.7%). Exactly 68.3% of the mothers agreed that Saudi vaccination is program sufficient while 55.0% disagreed that education in this subject is sufficient.

Table-3 Attitude of the mothers towards childhood immunization Mothers' practice of child vaccination¸ in Abha City, Aseer region, Saudi Arabia, 2018-19

Attitude of the mothers towards childhood immunization	Agree		Disagree		Not sure	
	N	%	N	%	N	%
Vaccinations are one of the most important rights of the child	980	92.6%	36	3.4%	42	4.0%
Vaccinating children is indicative of parents' concern for children's health	980	92.6%	33	3.1%	45	4.3%
Vaccinations are more beneficial than harmful	861	81.4%	104	9.8%	93	8.8%
Vaccination should not be performed too early	229	21.6%	467	44.1%	362	34.2%
The number of vaccinations is too high and should be reduced	272	25.7%	452	42.7%	334	31.6%
Vaccination costs outweigh the benefits	174	16.4%	524	49.5%	360	34.0%
The current Saudi vaccination program is sufficient	723	68.3%	129	12.2%	206	19.5%
Education in this subject is sufficient	359	34.0%	581	55.0%	117	11.1%

Table 4 illustrates a mothers' practice of childhood vaccination. A minority (5.4%) of them did not take their children to the health center to get vaccinations, and 20.5% had children with incomplete vaccinations. The biggest barrier to child vaccination was the parents not being able find time to leave work for the (22.6%), as well as children's sickness at the time of vaccination (19.4%), and laziness or neglect (11.5%) while more than a third of the mothers did not answer. The most common source of information was doctors (70.5%).

Table 4: **Mothers' practices toward child vaccination and reasons for not giving vaccinations to the child in Abha City, Aseer region, Saudi Arabia, 2018-19**

Mothers' practices of vaccinations		N	%
Do you take your children to the	Yes	1001	94.6%

health center to get vaccinations?	No	57	5.4%
Is your child immunization deficient?	Yes	217	20.5%
	No	841	79.5%
What are the causes for not receiving the vaccine on time? (n=217)	The child was sick at the time of the dose	42	19.4%
	Laziness or neglect	74	44.1%
	The health center is remote	19	8.8%
	Financial causes	11	5.1%
	Did not answer	71	32.7%
What are your sources of information about recommended vaccinations?	Doctor	784	70.5%
	Friends	152	14.4%
	Mass media	160	15.1%

Mothers' level of knowledge and its relationship with socio-demographic factors

Table 5 shows relationship between socio-demographic factors related and mothers' level of knowledge about vaccination. The majority (59.8%) of mothers with seven or more children had a significantly higher level of awareness, compared to 50.6% of those who had only one child (p=0.05). Significantly higher knowledge level was also observed among the 61.9% of mothers working in the medical care field (other mothers comprised 52.9%, p=0.048). Significantly higher knowledge levels (p=0.001) were observed among the mothers (61.9%) of those whose source of knowledge was mass media as compared to those whose source of information was doctors (55.2%) and friends (40.1%) respectively.

Table-5**. Relationship between socio-demographic factors and the mothers' level of knowledge about childhood immunization in Abha City, Aseer region, Saudi Arabia, 2018-19**

Factors		Level of knowledge				P
		Poor		Good		
		N	%	N	%	
Age in years	≤ 35 years	218	49.4	223	50.6	.231
	36 & above	268	43.4	349	56.6	
Education level	Up to secondary level	131	41.5	185	58.5	.143
	University	349	47.4	387	52.6	
Nationality	Saudi	477	45.7%	566	54.3	.271
	Non-Saudi	9	60.0%	6	40.0	
Family income (SR)	≤ 10000	191	47.8	288	52.2	.405
	>10000	295	44.8	365	55.2	
Number of children	≤ 4	276	48.9	288	51.0	0.05*
	≥ 5	210	42.5	284	57.5	
Working in a health care field	Yes	51	38.1%	83	61.9	0.048*
	No	435	47.1%	489	52.9	
Source of information	Doctors	334	44.8	412	55.2	0.001*
	Friends	91	59.9%	61	40.1	
	Mass media	61	38.1%	99	61.9	

Discussion

This study was conducted to identify the level of knowledge and attitude towards childhood immunization amongst Saudi mothers.

In this study more than 80% of the participants knew that vaccination prevent children from some serious infectious diseases. This finding is in accordance with the studies conducted in Taif (91.6%) (17) and Riyadh (92%) (18) and with the study conducted in UAE (85%) (19). However, proportion of response varies among studies, which may be due to difference in respondents, sampling methods, demographic factors, and mode of questions in the questionnaire. Regarding the knowledge of safety and effectiveness of combined vaccine, the present study reported that only 39.8% mothers approved that combined vaccines are safe and are as effective as single vaccines. This agrees with the Taif, and Riyadh based Saudi studies, in which only 37% and 41.6% of participants respectively knew that the administration of combine vaccine is safe and as effective as single dose and has no negative impacts on child health. This may be due to the lack of knowledge among parents about the safety of combine vaccine. It

may also be due to the participants' responses noting being based on sound scientific background; rather, emotionally driver where, overwhelmed mothers believed their infants could not tolerate the combine vaccine.

To explore the knowledge about contraindication of vaccinations, the current study identified that more than two thirds of the respondent mothers were ignorant about the contraindication of immunization. Similar studies conducted in Saudi Arabia (16, 17,18, 19, 20, 21) also showed findings coherent with this research. It is important to note that misunderstandings about contraindications of vaccines delayed childhood immunization and places the child at risk of infectious diseases. Interestingly this study and other studies in Saudi Arabia (16, 17, 18) have found that most of the mothers agreed with the importance of vaccinating children during immunization campaigns.

In this study, monthly family income and education level were not significantly associated with the mother's knowledge about vaccination. In contrast with the studies conducted in Saudi Arabia and UAE, the studies stated that parent's education and income were associated with their level of knowledge (17, 18, 19). This may be explained by the difference in respondents, methodology used and socio-demographic variation.

This study revealed that only 54.1% mothers have good level of knowledge about child vaccination, however the attitude of the mothers towards vaccination in most of investigated items was positive. Similar findings were reported in other studies in different parts of the world including Saudi Arabia (17,18, 19, 22, 23, 24, 25). A considerable proportion of mothers had negative attitude towards first dose's timing (early start of vaccine) and multiple doses of vaccine. This finding reflects that there is a gap of scientific information in the community regarding vaccinations. One of the reasons behind this might be the fear amongst the mothers that due to too many immunizations their children will be sick and will have a weakened immune system.

Although the focus of this study was on the knowledge and attitude, the practice of the mothers on child vaccinations, incomplete vaccinations, reasons for incomplete vaccination and source of knowledge were also investigated in this study. Considering the mothers' practice about child vaccination, one out of every five smothers had a child with an incomplete vaccination. This was attributed to child sickness during vaccination time, being busy at work, or even laziness which may be due to the perception among some mothers that vaccines are always dangerous. This study found that physicians were the main source of information for mothers however information through media has significantly associated with good knowledge of the mothers. The possible reason behind this could be due to a communication gap between the mothers and the physicians and the messages to mothers may not be clear or sufficient.

The worldwide vaccination target is to achieve more than 90% coverage of all available vaccines by 2020, with the aid of individual countries' national immunization programs (26). Despite this, there is an upward trend in vaccine hesitancy as well as a delay in acceptance or refusal of vaccines regardless of the availability of vaccination services (15). This study found that parents who were concerned about vaccinations had some limitations in their willingness to immunize their children. The main factor in vaccine hesitancy is poor knowledge, Results of this study shows a direction toward the barriers to children's immunization and recommends that raising awareness through training regarding benefits of immunization and helping mothers to overcome the fear and misconceptions. It may also illustrate best practices of medical staff and mothers regarding childhood vaccines, thus providing a clarification of their risks and benefits, and information about the risk of diseases among non-vaccinated people should be part of the curriculum in immunization areas.

Conclusions and recommendations

This study revealed that more than half of the mothers who participated had knowledge regarding vaccination and child immunization, especially those with many children and those who worked in the medical field.

It is evident from the present study that there is still a lack of appropriate knowledge and information amongst the mothers who are prime care giver of their children. Thus, more effort should be made to improve mothers' knowledge about the importance of completing their children's vaccination schedule and bring about a change in negative attitudes and misconceptions towards vaccine safety. Bridging the gap in knowledge and information is essential and further research should be carried out to assess periodic changes and trends in parental awareness regarding immunization.

Study limitations and strengths

The present study has certain limitations. It was carried out in one city, Abha, following a convenience, non-random sampling technique; thus, its external validity is limited. Moreover, it followed a cross-sectional design, in which the main weakness is the lack of clear temporal relationship between dependent and independent variables. In addition, participants' responses in this study were completely subjective. However, there are points of strength, including a large sample size and the wide coverage of all primary care centers in Abha City.

Acknowledgments

We would like to acknowledge the expertise of *Prof. Shamsun N. Khalil* from department of family and community Medicine, college of Medicine, King Khalid University

Declaration of Interest

No conflict of interest to declare.

References

1. WHO. Immunization. WHO; Geneva,

Switzerland: 2019. https://www.who.int/news-room/facts-in-pictures/detail/immunization

2. Larson HJ, de Figueiredo A, Xiahong Z, Schulz WS, Verger P, Johnston IG, et al. The state of vaccine confidence 2016: global insights through a 67-country survey. EBioMed 2016;12:295–301. https://doi.org/10.1016/j. ebiom.2016.08.042
3. Dempsey AF, Schaffer S, Singer D, Butchart A, Davis M, Freed GL. Alternative vaccination schedule preferences among parents of young children. Pediatrics. 2011;128(5): 848–56. doi: 10.1542/peds.2011-0400
4. Robison SG, Groom H, Young C. Frequency of alternative immunization schedule use in a metropolitan area. Pediatrics. 2012;130(1):32–8. doi: 10.1542/peds.2011-3154
5. Lovrić Makarić Z, Kolarić B, Tomljenović M, Posavec M. Attitudes and beliefs related to childhood vaccinations among parents of 6 years old children in Zagreb, Croatia. Vaccine. 2018 Nov 26;36(49):7530-7535. doi: 10.1016/j.vaccine.2018.10.055. Epub 2018 Oct 23. PMID: 30366807
6. Committee to Review Adverse Effects of Vaccines, Institute of Medicine. Adverse effects of vaccines: evidence and causality. Washington, DC: National Academies Press; 2011.
7. Dubé E, Gagnon D, Zhou Z, Deceuninck G. Parental vaccine hesitancy in Quebec (Canada). PLoS Curr 2016. https://doi.org/10.1371/currents.outbreaks. 9e239605f4d320c6ad27ce2aea5aaad2
8. Dubé E, Vivion M, Sauvageau C, Gagneur A, Gagnon R, Guay M. Nature Does Things Well, Why Should We Interfere?": Vaccine Hesitancy Among Mothers.Qual Health Res. 2016 Feb; 26(3):411-25.
9. McCauley MM, Kennedy A, Basket M, Sheedy K. Exploring the choice to refuse or delay vaccines: a national survey of parents of 6- through 23-month-olds. Acad Pediatr. 2012;12(5):375–83. doi: 10.1016/j.acap.2012.06.007
10. Kennedy A, LaVail K, Nowak G, Basket M, Landry S. Confidence about vaccines in the United States: understanding parents' perceptions. Health Aff. 2011;30(6):1151–9. doi: 10.1377/hlthaff.2011.0396
11. Karafillakis E, Larson, E, H. The benefit of the doubt or doubts over benefits? A systematic literature review of perceived risks of vaccines in European populations. Vaccine 2017; 35:37; 4840-50. https://doi.org/10.1016/j.vaccine.2017.07.061
12. Mergler MJ, Omer SB, Pan WK, Navar-Boggan AM, Orenstein W, Marcuse EK, Taylor J, DeHart MP, Carter TC, Damico A, Halsey N, Salmon DA. Association of vaccine-related attitudes and beliefs between parents and health care providers. Vaccine. 2013 23;31(41):4591-5. doi: 10.1016/j.vaccine.2013.07.039. Epub 2013 Jul 27. PMID: 23896424
13. Stefanoff P, Mamelund SE, Robinson M, Netterlid E, Tuells J, Bergsaker MA, Heijbel H, Yarwood J. VACSATC working group on standardization of attitudinal studies in Europe. Tracking parental attitudes on vaccination across European countries: the Vaccine Safety, Attitudes, Training and Communication Project (VACSATC). Vaccine. 2010;28(35):5731–7. doi: 10.1016/j.vaccine.2010.06.009
14. MOH Childhood Vaccines Available Daily in all Health Centers. [(accessed on 20 September 2020)]; Available online https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/News-2017-07-20-001.aspx.
15. Alabadi M, Aldawood Z. Parents' Knowledge, Attitude and Perceptions on Childhood Vaccination in Saudi Arabia: A Systematic Literature Review. *Vaccines (Basel)*. 2020;8(4):750. doi:10.3390/vaccines8040750
16. AlGoraini Y., AlDujayn N.N., AlRasheed M.A., Bashawri Y.E., Alsubaie S.S., AlShahrani D.A. Confidence toward vaccination as reported by parents of children admitted to a tertiary care hospital in Riyadh, Saudi Arabia: A cross sectional study. *Vacunas.* 2020;21:95–104.
17. Yousif M., Abdulrahman A. Parents' knowledge and attitudes on childhood immunization, Taif, Saudi Arabia. *J. Vaccines Vaccin.* 2013;5:2. [Google Scholar]
18. ALAmri ES, Horaib YF, Alanazi WR. Knowledge and attitudes of parents on childhood immunization in Riyadh, Saudi Arabia. Egypt J Hosp Med. 2018;77(6):5973–82. doi:10.12816/0043085
19. Bernsen RM, Al-Zahmi FR, Al-Ali NA, Hamoudi RO, Ali NA et al. (2011): Knowledge, attitude and practice towards immunizations among mothers in a traditional city in the United Arab Emirates. Journal of Medical Sciences, 4: 114-121
20. Aljumah K., al Badr H., Alzaidi N., al Mutari A., Alhwaitan A. *Parents' Adherence, Knowledge and Attitudes towards Childhood Vaccination Program in Saudi Arabia in Value in Health.* Elsevier Science Inc.; New York, NY, USA: 2017. pp. 10010–11710. 360 Park Ave South.
21. Alolayan A., Almotairi B., Alshammari S., Alhearri M., Alsuhaibani M. Seasonal influenza vaccination among Saudi children: Parental barriers and willingness to vaccinate their children. *Int. J. Environ. Res. Public Health.* 2019;16:4226
22. Asim M, Malik N, Yousaf H, Gillani I and Habib N (2012): An assessment of parental knowledge, belief and attitude toward childhood immunization among minorities in rural areas of district Faisalabad, Pakistan. Mediterranean Journal of Social Sciences, 3: 153-159.

23. Mollema L, Wijers N, Hahné SJ, van der Klis FR, Boshuizen HC et al. (2012): Participation in and attitude towards the national immunization program in the Netherlands: data from population-based questionnaires. BMC Public Health, 12: 57-63.
24. Borràs E, Domínguez A, Fuentes M, Batalla J, Cardeñosa N et al. (2009): Parental knowledge of paediatric vaccination. BMC Public Health, 9: 154-162.
25. GebreEyesus FA, Tarekegn TT, Amlak BT, Shiferaw BZ, Emeria MS, Geleta OT, Mewahegn AA, Feleke DG, Chanie ES. Knowledge, Attitude, and Practices of Parents About Immunization of Infants and Its Associated Factors in Wadla Woreda, North East Ethiopia, 2019. *Pediatric Health Med Ther*. 2021;12:223-238 https://doi.org/10.2147/PHMT.S295378
26. Feldstein LR, Mariat S, Gacic-Dobo M, Diallo MS, Conklin LM, Wallace AS. Global routine vaccination coverage, 2016. MMWR Morb Mortal Wkly Rep. 2017;66(45):1252–5. doi: 10.15585/mmwr.mm6645a3