https://doi.org/10.15218/ejnm.2022.06 Erbil j. nurs. midwifery, Vol. 5, No. (1), May 2022
Original Article

# Knowledge and Attitude of Mothers about Children Immunization and Barriers to Adherence the Program, in Erbil City

**Suham Mirhamad Abdullah;** *Department of Nursing, College of Nursing, Hawler Medical University, Erbil, Iraq.*
(Correspondence: suham.barza@gmail.com)
**Ibrahim Hasan Mustafa;** *Department of Nursing, College of Nursing, Hawler Medical University, Erbil, Iraq.*

## ABSTRACT

**Background and objective:** Immunization programs are one of the most important methods to prevent infections and sickness among children. We can overcome many obstacles if mothers have the necessary knowledge and attitude regarding vaccines. The study aims to assess mothers' knowledge, attitudes, and barriers related to immunization programs and associations related to socio-demographic characteristics.

**Methods:** A cross-sectional study design was carried out in Erbil city across six primary health care centers (Hawkari, Azadi, Runaki, Shadi, Mala Afandi, and Nazdar Bamarni) during the period of January 5, 2021, to April 8, 2021. Non-probability convenience sampling methods were used. The sample consisted of 410 mothers ages 18 and older. A questionnaire with four parts (socio-demographic characteristics, knowledge, attitude, and barriers to adherence immunization programs) was used to collect data. Statistical package for social science (version 23) was used for data analysis. Chi-square and Fisher exact tests were used to determine the association between socio-demographic characteristics and knowledge and attitudes. Frequency and percentage were used to identify barriers.

**Results:** The study findings showed a statistically significant association between the knowledge of mothers and their age, educational level, occupation, and socioeconomic status. Mothers have a high attitude regarding immunizations. The majority (69.3%) of mothers have not had any missed opportunities for not given immunizations. The most common reasons for not giving immunizations were mothers being busy and child sickness at the time of immunizations.

**Conclusions:** There was statistically significant association between mother's knowledge and age, education, occupations, and socioeconomic status. A high level of attitude was recorded among mothers regarding immunizations. Mothers reported being busy on the day of the immunizations and child sickness as the most common barriers to receiving immunizations.

**Keywords:** Childhood immunization; Mothers; Knowledge; Attitude; Barriers.

*Received: 30/11/2021* *Accepted: 01/02/2022* *Published: 30/5/2022*

## INTRODUCTION

Immunity can be defined as a state of creating sufficient biological defenses in the body to fight harmful microbes (including bacteria or viruses) to avoid infections, disease, or another unwanted biological invasion. Immunization is one of the processes of enhancing the immune system against certain infectious diseases. Therefore, immunization can develop an immune system and body resistance against

harmful infections [1]. Immunizations are cost-effective methods to prevent death and disease caused by harmful infectious diseases. Globally immunization itself represents the gateway to providing comprehensive health care to which all children have been entitled. Moreover, pediatric immunization programs played a vital role in eradicating many childhood infectious diseases [2, 3]. Many studies indicated the importance of knowing parents' impressions toward vaccination to find the positive and negative attitudes and emphases on vaccine rejection. Therefore, there is a need to carry out studies to understand people's behavior, which plays a role in the failure to comply with the vaccination, and then to find scientific recommendations about targeting efforts to fight misinformation on certain deviant types. These are also giving rise to a new research approach such as studying all these factors that are focusing on underlying attitudes that goes beyond notions of vaccine acceptance, including knowledge of communities, knowledge about how they relate and trust the institutions involved with vaccination services, and knowledge of how much active demand there is for vaccination at the community level and others [4]. A study carried out in Sub-Saharan Africa to identify the best methods for achieving the desired levels of immunizations found many barriers mothers face in giving vaccinations to their children. These barriers include social and environmental barriers (gender, beliefs, and socio-culture factors) and barriers related to the health care system. The study recommended combined efforts of healthcare systems and providers, appropriately addressing socio-cultural factors among the communities and emphasizing scientific evidence on effective interventions to address these barriers and achieve higher vaccination rates. Vaccination is one of the leading public health methods for preventing many infectious diseases, especially among children. There is a need to encourage parents to involve their children in immunization programs and improve compliance with immunization programs [5]. The study aimed to assess mothers' knowledge, attitude, and barriers to immunization programs.

## METHODS

A descriptive study was carried out across six primary health care centers (PHCC) in Erbil city from January 5, 2021, to April 8, 2021. Due to social distancing and preventative measures against COVID 19, only a few centers (Hawkari, Azadi, Runaki, Shadi, Mala Afandi, and Nazdar Bamarni) were randomly selected to be included in the study. The sample size was calculated using the STATSTM micros phot program (California Inc., California University, 1998), which depends on the population. The sample consisted of 410 mothers distributed among the six PHCCs depending on the proportions of visitors in each PHCC (Hawkari: 50, Azadi: 117, Runaki: 60, Shadi: 53, Mala: 68, and Nazdar Bamarni: 62). Data were collected by using the non-probability convenience sampling technique. Mothers aged ≥18 years were included. A questionnaire was constructed for data collection consisted of four parts. Part I includes mothers' socio-demographic characteristics, including age, years of formal education, family income, occupation, and socio-economic status (SES), family income classified according to monthly income, and daily physiological needs In this manner, income was classified as insufficient if it did not cover daily needs, sufficient if it did cover daily needs but without extra, and surplus if it covered daily needs while saving money. Hasan (2010) [17] adapted the SEC. We give ten points for educational level (half a point for each year of study), ten points for

husbands' education, eight points for crowding index, five points for mother occupation, five points for husband occupation, four points for house ownership, and three points for car ownership (with some modifications). The total total score was 45, which was divided into three parts: Low (15), Middle (15 to 30), and High (15) scores (30 to 45) [6]. The mothers' occupations were classified.

Part II related to mothers' knowledge about immunization and was assessed by 14 items. The questionnaire was scored and rated on two options (1 for Yes and 0 for No). The mothers' knowledge is categorized into three levels: low (a score ≤ 4.7), middle (a score between 4.8 to 9.4), and high level (a score ≥ 9.5).

Part III related to mothers' attitudes and was assessed by 14 items scored on Likert scales as recommended by Polite and Hungler (1999) [8]. Mothers' attitudes were classified into three levels: (1) low attitude (a score ≤ 14), (2) no idea ( a score between 15 to 28 ), and (3) high attitude (a score ≥ 29).

Part IV related to barriers to adherence to immunization programs assessed by 20 questions on a Yes or No scale.

Data were analyzed using the statistical package for social science (SPSS, version 23). The mean was calculated to summarize numerical variables, and proportions were calculated for categorical variables. Chi-square test was used to compare the proportions of two groups' socio-demographic characteristics and knowledge and attitude. Fisher exact tests were used in case 20% or more of cells have less than five.

The Scientific and Ethical Committee of the College of Nursing Hawler Medical University approved the study protocol. In addition, formal permission was granted by the Erbil Directorate of Health planning department to Braiaty, Kurdistan, Mala AFandi, Shadi, Hawkari, Nazdar Bamarni, and Azadi primary health care centers for data collection. The required information was explained, and informed oral consent was obtained from all participants. Confidentiality was assured about the participant's identity and personal information. The data collected were stored in the SPSS file was password protected.

## RESULTS

Table 1 shows the socio-demographic and socioeconomic characteristics of the study population. More than half (53.4%) of the population were in aged 22 to 31, and only 2.2% were aged 42 and older. 40.2% of mothers graduated college, 9.3 % of mothers were postgraduates, and 39.8% were intermediate and secondary graduates. Approximately half (51%) of mothers worked unskilled jobs, 10% were unemployed, and 26.8% were migrants. Results show that 22.2% of mothers had exceeded income for daily needs, 40% were of medium socio-economic status, and a little over a quarter (26%) were of low socioeconomic. Table 2 describes mother's knowledge related to vaccinations. Most women (95.1%) have knowledge that measles is prevented by vaccination, 75.1% of women have no knowledge that diphtheria is prevented by vaccination, and 67.1% of women have no knowledge that hepatitis B can be prevented by vaccination. Most of the mothers (99%) in the sample have information that vaccination prevents infectious diseases. 91% of women reported that vaccinations help maintain their health, and 82% report that vaccinations help reduce child mortality and protect children from complications. The highest percentage (64.4%) of mothers reported rash as a side effect of vaccines, followed by fever (61.2%), swelling (52%), and redness (51%).

**Table 1:** Distribution of study sample by socio demographic and socioeconomic characteristics

| Variables | n=(410) | No. | (%) |
|---|---|---|---|
| **Age group** | >22 | 47 | (11.5) |
| | 22-26 | 107 | (26.1) |
| | 27-31 | 112 | (27.3) |
| | 32-36 | 65 | (15.9) |
| | 37-41 | 70 | (17.1) |
| | 42+ | 9 | (2.1) |
| **Educational levels of mothers** | Primary | 44 | (10.7) |
| | Intermediate | 72 | (17.6) |
| | Secondary | 91 | (22.2) |
| | Institute and college | 165 | (40.2) |
| | Postgraduate | 38 | (9.3) |
| **Occupation of mother** | Unemployed or housewife | 41 | (10) |
| | Unskilled | 208 | (50.7) |
| | Professional | 119 | (29) |
| | High professional | 42 | (10.2) |
| **Immigration status** | Migrant | 110 | (26.8) |
| | Resident | 300 | (73.2) |
| **Monthly family income** | Sufficient for daily needs | 157 | (38.3) |
| | Insufficient for daily needs | 162 | (39.5) |
| | Exceed for daily needs | 91 | (22.2) |
| **Socio-economic status** | Low | 105 | (25.6) |
| | Medium | 162 | (39.5) |
| | High | 143 | (34.9) |

**Table 2:** Descriptive Statistics related to mothers' knowledge about vaccination

| Variables | n=(410) | | No. | (%) |
|---|---|---|---|---|
| Disease controlled by obligatory vaccination | 1.Measles | Yes | 390 | (95.1) |
| | | No | 20 | (4.9) |
| | 2.Poliomyelitis | Yes | 327 | (79.8) |
| | | No | 83 | (20.2) |
| | 3.Tetanus and Pertussis disease | Yes | 237 | (57.8) |
| | | No | 173 | (42.2) |
| | 4.Diphtheria | Yes | 102 | (24.9) |
| | | No | 308 | (75.1) |
| | 5.Hepatitis B virus | Yes | 135 | (32.9) |
| | | No | 275 | (67.1) |
| | 6.Mumps | Yes | 269 | (65.6) |
| | | No | 140 | (34.1) |
| What are the important of vaccination | 7.Prevent infectious diseases | Yes | 405 | (98.9) |
| | | No | 5 | (1.2) |
| | 8.Reduce child mortality rate | Yes | 335 | (81.7) |
| | | No | 75 | (18.3) |
| | 9.Protect child from complication | Yes | 336 | (82) |
| | | No | 74 | (18) |
| Vaccine side effect | 10.Fever | Yes | 251 | (61.2) |
| | | No | 159 | (38.8) |
| | 11.Rash | Yes | 264 | (64.4) |
| | | No | 146 | (35.6) |
| | 12.Redness | Yes | 207 | (50.5) |
| | | No | 203 | (49.5) |
| | 13.Pain | Yes | 173 | (42,2) |
| | | No | 237 | (57.8) |
| | 14.Swelling | Yes | 213 | (51.9) |

Table 3 describes the mother's positive and negative attitudes towards vaccinations. Most of the sample (73%) report minor side effects with immunization, and 91% of mothers believe that vaccines help children's health. The data shows that 17.2% have no idea about health authority (education role) in the vaccination programs and that 87.1% of mothers have a positive attitude towards reducing missing opportunities of child vaccinations. The majority of mothers (82.9%) believe that it is essential to advise other mothers to vaccinate their children. The data shows that 66.1% of mothers prefer a female vaccinator. 69.0% of the sample believe in delaying baby bath till two days after BCG vaccination, 42.9% have no idea if a child who came in contact with another child with measles should not be vaccinated against measles, and 48% of mothers believe that it is better to get immunity by catching a disease instead of by being vaccinated.

Table 4 describes the associations between mothers' level of knowledge and their Socio demographic and socioeconomic status. Mothers with a high level of knowledge (53%) were aged 37 to 41 years, and mothers with a low level of knowledge (32.2%) were aged 22 to 26 years. Forty percent of mothers with a low level of knowledge have primary and intermediate levels of education, and 68% of mothers with high levels of education graduated from college and institutes or were postgraduates. Mothers with low and medium levels of knowledge (46% and 45%, respectively) report a medium socioeconomic status, while mothers with a high level of knowledge report a high socioeconomic status. Statistically significant associations were observed between mothers' age and their knowledge about immunizations ($p<0.001$), levels of education and knowledge ($p<0.001$), occupation and knowledge of mothers ($p<0.001$), and mothers' knowledge and socioeconomic status ($p<0.001$).

Table 5 shows the associations between mothers' attitudes and their Sociodemographic and socioeconomic status. Most mothers (93.4) expressed a high level of attitude toward vaccination. There was no statistically significant association between mothers' level of attitude related to immunizations and their age ($p=0.116$) or education levels ($p=0.064$). The results show that 63 % of mothers with a medium level of attitude worked unskilled jobs, and 40.8% of mothers with a high level of attitude worked professional jobs. A statistically significant association was observed between mothers' attitudes and \occupations ($p=0.024$). There was no significant association between mothers' attitude and their levels of income ($p=03.65$), and socioeconomic status ($p= 0.083$).

Table 6 shows that the majority of mothers (69.3%) have not had any missed opportunities for immunization. Among those who had one or more missed opportunities, 19 % have one missed opportunity to the given immunizations for their children.

Table 7 shows that, in general, most mothers report no barriers to giving immunizations to their children. The most common barriers reported were mothers busy on the day of immunizations (43.4%), and children's sickness at the time of immunization (29%).

**Table 3:** Descriptive Statistics of sample according to their positive and negative attitudes toward vaccination

| Items | | No. | (%) |
|---|---|---|---|
| 1. Do you believe that minor side effect occur with immunization? | Correct | 298 | (72.7) |
| | No ides | 53 | (12.9) |
| | Incorrect | 59 | (14.4) |
| 2. Do you believe that vaccination helps the child's health? | Correct | 373 | (91) |
| | No idea | 27 | (6.6) |
| | Incorrect | 10 | (2.4) |
| 3. Do you believe that health authority should emphasize the important of immunization (education role) of children? | Correct | 326 | (79.5) |
| | No idea | 70 | (17.2) |
| | Incorrect | 14 | (3.4) |
| 4. Do you believe that the responsibility of mothers reduce missing opportunity of child vaccination? | Correct | 357 | (87.1) |
| | No idea | 32 | (7.8) |
| | incorrect | 21 | (5.1) |
| 5. Do you believe less knowledgeable mothers do not support immunization in the community? | Correct | 12 | (2.9) |
| | No idea | 93 | (22.7) |
| | Incorrect | 305 | (74.4) |
| 6. Do you believe that advising other mothers for vaccinating their children? | Correct | 340 | (82.9) |
| | No idea | 59 | (14.4) |
| | Incorrect | 11 | (2.7) |
| 7. Do you believe that child with allergy to egg is contraindicated to be vaccinated? | Correct | 152 | (37.1) |
| | No idea | 246 | (60) |
| | Incorrect | 12 | (2.9) |
| 8.Do you prefer vaccination at public health centers | Correct | 271 | (66.6) |
| | No idea | 126 | (30.7) |
| | Incorrect | 13 | (3.2) |
| 9.Do you believe that vaccination of children having cold and cough should be delayed until full recovery? | Correct | 300 | (73.2) |
| | No idea | 97 | (23.7) |
| | Incorrect | 13 | (3.1) |
| 10. Do you believe that preferring female vaccinator than male? | Correct | 271 | (66.1) |
| | No idea | 78 | (19) |
| | Incorrect | 61 | (14.9) |
| 11. Do you believe that delaying baby bath till two days after vaccination BCG? | Correct | 283 | (69) |
| | No idea | 99 | (24.1) |
| | Incorrect | 28 | (6.8) |
| 12. Do you believe that communicable disease weakens the immune system? | Correct | 77 | (18.8) |
| | No idea | 191 | (46.6) |
| | Incorrect | 142 | (34.6) |
| 13. Do you believe that children who come in contact with a child who got measles should not be vaccinated against measles? | Correct | 63 | (15.4) |
| | No idea | 190 | (46.3) |
| | Incorrect | 157 | (38.3) |
| 14. Do you believe that it is better to get immunity by catching to a disease instead of by being vaccinated? | Correct | 38 | (9.3) |
| | No idea | 176 | (42.9) |
| | Incorrect | 196 | (47.8) |

**Table 4:** Association between mothers' level of knowledge with their socio-demographic and socio-economic status

| Items | | Knowledge | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Low | | Medium | | High | | |
| | | No. | (%) | No. | (%) | No. | (%) | P-value |
| Mothers age groups | <22 | 22 | (18) | 22 | (8.9) | 3 | (7.5) | 0.001 |
| | 22-26 | 39 | (32) | 63 | (25) | 5 | (13) | |
| | 27-31 | 27 | (22) | 76 | (31) | 9 | (23) | |
| | 32-36 | 21 | (17) | 42 | (17) | 2 | (5) | |
| | 37-41 | 8 | (6.7) | 41 | (16) | 21 | (53) | |
| | 42+ | 4 | (3.1) | 5 | (2) | 0 | (0) | |
| Education levels of mothers | Primary | 24 | (20) | 19 | (7.6) | 1 | (2.5) | 0.001 |
| | Intermediate | 24 | (20) | 45 | (18) | 3 | (7.5) | |
| | Secondary | 31 | (26) | 51 | (22) | 9 | (23) | |
| | Institute &college | 41 | (34) | 112 | (45) | 12 | (30) | |
| | Postgraduate | 1 | (0.8) | 22 | (8.8) | 15 | (38) | |
| Occupation of mother | Unemployed | 14 | (12) | 25 | (10) | 2 | (5) | 0.001 |
| | Unskilled | 85 | (70) | 112 | (45) | 11 | (28) | |
| | Professional | 20 | (16) | 87 | (35) | 12 | (30) | |
| | High professional | 2 | (1.4) | 25 | (10) | 15 | (38) | |
| Immigration statue | Migrant | 38 | (30) | 63 | (25) | 9 | (23) | 0.378 |
| | Resident | 83 | (70) | 186 | (75) | 31 | (78) | |
| Monthly family income | Sufficient for daily needs | 25 | (24) | 122 | (49) | 10 | (25) | 0.165 |
| | Insufficient for daily needs | 42 | (35) | 113 | (11) | 7 | (18) | |
| | Exceed for daily needs | 48 | (40) | 33 | (13) | 10 | (2.5) | |
| Socio-economic status of mothers | Low | 48 | (40) | 44 | (18) | 5 | (13) | <0.001 |
| | Medium | 55 | (46) | 111 | (45) | 9 | (23) | |
| | High | 18 | (15) | 94 | (38) | 26 | (65) | |

**Table 5:** Association between mothers' attitude with their socio-demographic and socio-economic status

| Items | | Attitude | | | | P-value |
|---|---|---|---|---|---|---|
| | | Medium | | High | | |
| | | No. | (%) | No. | (%) | |
| Mothers age group | 17-21 | 5 | (18.5) | 42 | (11) | 0.116 |
| | 22-26 | 6 | (22.2) | 101 | (26.4) | |
| | 27-31 | 3 | (11.1) | 109 | (28.5) | |
| | 32-36 | 8 | (29.7) | 57 | (14.9) | |
| | 37-41 | 5 | (18.5) | 65 | (17) | |
| | 42+ | 0 | (0) | 9 | (2.2) | |
| | Total | 27 | (100) | 383 | (100) | |
| Educational levels of mother | Primary | 2 | (7.4) | 42 | (11) | 0.064 |
| | Intermediate | 9 | (33.3) | 63 | (16.4) | |
| | Secondary | 6 | (22.1) | 85 | (22.2) | |
| | Institute &college | 10 | (37) | 155 | (40.5) | |
| | Postgraduate | 0 | (0) | 38 | (9.9) | |
| Occupation of mothers | Unemployed | 5 | (18.5) | 36 | (9.3) | 0.024 |
| | Unskilled | 17 | (63) | 191 | (49.9) | |
| | Professional | 5 | (18.5) | 114 | (29.8) | |
| | High professional | 0 | (0) | 42 | (11) | |
| Immigration statue | Migrant | 9 | (33.3) | 101 | (26.4) | 0.43 |
| | Resident | 18 | (66.7) | 282 | (73.6) | |
| Monthly family income | Sufficient for daily needs | 10 | (37) | 147 | (38.3) | 0.65 |
| | Insufficient for daily needs | 9 | (33.2) | 100 | (26.1) | |
| | Exceed daily needs | 4 | (14.8) | 46 | (12) | |
| Socio-economic statues of mothers | Low | 7 | (25.9) | 90 | (23.5) | 0.083 |

**Table 6:** Data related to number of missed opportunity

| Number of missed opportunity | n=(410) | (%) |
|---|---|---|
| 1 Item | 78 | (19) |
| 2 Items | 24 | (5.9) |
| 3 Items | 11 | (2.7) |
| 4 Items | 13 | (3.1) |
| Total | 126 | (30.7) |
| No missed opportunity | 284 | (69.3) |
| **Total** | **410** | **(100)** |

**Table 7:** Barriers of incomplete immunization

| Barriers | Yes | | No | |
|---|---|---|---|---|
| | No. | (%) | No. | (%) |
| Domestic work | 60 | (14.6) | 350 | (85.4) |
| Corona virus | 57 | (13.9) | 353 | (87.3) |
| Quarantine | 5 | (1.2) | 405 | (98.8) |
| Mother was too busy | 178 | (43.4) | 232 | (56.6) |
| There is no risk of infection | 13 | (3.2) | 397 | (96.8) |
| The vaccine was not available | 18 | (4.4) | 392 | (95.6) |
| The time for vaccination was not convenient | 88 | (21.5) | 322 | (78.5) |
| The child was not vaccinated because of illness | 82 | (20) | 328 | (80) |
| Was not aware for need of immunization | 78 | (19) | 332 | (81) |
| mother does not have information about the need for second and third dose | 17 | (4.1) | 393 | (95.9) |
| Distrust in the vaccination | 45 | (11) | 365 | (89) |
| Fear of side effect after vaccination | 55 | (13.4) | 355 | (86.6) |
| Mother health state | 118 | (21.8) | 292 | (71.2) |
| Social engagements | 26 | (6.3) | 384 | (93.7) |
| Traveling | 41 | (10) | 369 | (900 |
| Complications from previous injections | 28 | (6.8) | 382 | (93.2) |
| Long distance trekking/walking | 35 | (8.5) | 375 | (91.5) |
| Long waiting time | 16 | (3.9) | 394 | (96.1) |
| Lack of financial reasons | 49 | (12) | 361 | (88) |
| Child sickness | 117 | (28.5) | 293 | (71.5) |

## DISCUSSION

The present study shows a statistically significant association between mothers' age and levels of knowledge regarding vaccination. Increasing age was associated with increased knowledge. In contrast, a study in Saudi Arabia by Almutairi et al., reported no significant association between mothers' age and knowledge regarding vaccination. The differences may be related to the width of age categories, which were not fixed in all levels in the study [10]. The present study shows an association between an increased level of mothers' education and an increased level of knowledge. The output of the present study agrees with a 2016 study by Faris et al., which reported a significant association between mothers' knowledge and their educational levels [11]. Another study indicated that a high level of knowledge was associated with completing higher education and higher income [12]. In the present study, there was an association between mothers' knowledge and occupation. In contrast with a study by Almutairi et al., there was no evidence of an association between mothers' knowledge and occupation. The differences may be related to the classification jobs between both studies and differences related to culture. The present study indicated no association between income and mothers' knowledge regarding vaccination. The present study shows that increased occupational classes were associated with knowledge classes. Findings from Almutairi et al. indicated no evidence of an association between mothers' level knowledge and mothers' occupation type [9]. The current study indicated that an increase in mothers' knowledge was associated with an increase in socioeconomic status. A study by Kyprianidou et al., indicated that mothers with a medium level of knowledge about immunizations were associated with medium or high levels of income, and a high level of knowledge was associated with completion of higher education and higher income [7].The present study found that mothers working in professional occupations had high attitudes regarding immunizations. A 2019 cross-sectional study carried out in Malaysia of 200 postnatal mothers reported a statistically significant association between mothers' occupations and their attitudes regarding vaccination [15]. The present study shows that around one-third of mothers in the sample have missed opportunities for vaccinating their children. The main barriers to not giving immunization were that mothers were busy and their children were sick at vaccination. A 2020 study in Mogadishu, Somalia, report that full vaccination of children under five years were very low. Older marital status of caregivers, low educational background of fathers, low monthly income, premature birth, younger age of children, vaccine unavailability at health centers, cost unaffordability, mothers who were given their births in home, low level of knowledge of caregiver, low levels of attitude, and level of low practice on immunization were found to be the main barriers to full immunization coverage [8]. The results of a systematic study carried out in Sub-Saharan Africa indicated that gender, beliefs, and socio-culture factors of communities that the parents live play a role in parents' decision to vaccinate their children [9].

## Conclusion

There were statistically significant associations between mothers' age and vaccination knowledge, mothers' know ledge and

educational levels, and mothers' attitudes and occupation. Around one-third of the sample have missed the opportunity of provided immunizations; among them, the highest percentages were recorded in mothers who were busy or their infants sick at the time of immunizations.

## Conflict of interest

No conflict of interest.

## REFERENCES

[1] Chris-Otubor GO, Dangiwa DA, Ior LD, and Anukam NC. Assessment of knowledge, attitudes and practices of mothers in Jos North regarding immunization. *IOSR Journal Of Pharmacy.* 2015 Jun; 5(6):34-45.

[2] Bergin N, Murtagh J, Philip RK. Maternal vaccination as an essential component of life-course immunization and its contribution to preventive neonatology. *International Journal of Environmental Research and public health.* 2018 May; 15(5):847.

[3] Reporter DN. Bacterial meningitis. Guest Editor *Executive Director's Column.* 39 (2):3.

[4] Yufika A, Wagner AL, Nawawi Y, Wahyuniati N, Anwar S, Yusri F, Haryanti N, Wijayanti NP, Rizal R, Fitriani D, Maulida NF. Parents' hesitancy towards vaccination in Indonesia: A cross-sectional study in Indonesia. *Vaccine.* 2020 Mar 4;38(11):2592-9.

[5] Dimala CA, Kika BT, Kadia BM, Blencowe H. Current challenges and proposed solutions to the effective implementation of the RTS, S/AS01 Malaria Vaccine Program in sub-Saharan Africa: A systematic review. *PloS one*. 2018 Dec 31;13 (12):e0209744.

[6] Al-Ansari NB. Pattern of Malocclusion in Iraqi Patients Seeking Orthodontic Treatment.

[7] Kyprianidou M., Tzira E., Galanis P., Giannakou K. Knowledge of mothers regarding children's vaccinations in Cyprus: A cross-sectional study. *PLoS One*. 2021; 16 (9): e0257590. Doi: 10.1371/ Journal.Pone.0257590.

[8] Polit DF, Beck CT. *Nursing research: Principles and methods.* Lippincott Williams & Wilkins; 2004.

[9] Almutairi WM., Alsharif F., Khamis F., Sallam L., Sharif L., Alsufyani A., et al Assessment of Mothers' Knowledge, Attitudes, and Practices Regarding Childhood Vaccination during the First Five Years of Life in Saudi Arabia. *Nurses. Repots*. 2021, 11, 506–516.

[10] Ramadan HA, Soliman SM, El-Kader RG. Knowledge, attitude and practice of mothers toward children's obligatory vaccination. *Journal of Nursing and Health Science*. 2016 Jul;5(4):22-8.

[11] Mahalingam S, Soori A, Ram P, Achappa B, Chowta M, Madi D. Knowledge, attitude and perceptions of mothers with children under five years of age about vaccination in Mangalore, India. *Asian Journal of Medical Sciences.* 2014 May 16;5(4):52-7.

[12] Singh J, Deepti SS, Mahajan S, Lal M, Singh T, Neki NS. Assessment of Socio-demographic factors affecting Immunization status of children of age 0-2 years in Slums of Amritsar city. *International Journal of Current Research in PubMed Science.* 2018;4(3):17-25.

[13] Gul S, Khalil R. Immunisation knowledge and practices among mothers attending a paediatric clinic in Karachi, Pakistan. *International Journal of Advances in Medicine.* 2016 Jul;3 (3):656-1.

[14] Awosan KJ, Ibrahim MT, Yunusa EU, Isah BA, Raji MO, Abubakar N. Knowledge, Attitude and Compliance with Full Immunization of Children Against Vaccine Preventable Diseases among Pregnant Mothers in Sokoto, Nigeria. *International Journal Contemp Med Research.* 2018; 5(6):F10-6.

[15] Umeh CA, Ahaneku HP. The impact of declining vaccination coverage on measles control: a case study of Abia state Nigeria. Pan *African Medical Journal.* 2013; 15(1).

[16] Al-Lela, O. Q. B., Bahari, M. B., Al-Qazaz, H. K., Salih, M. R., Jamshed, S. Q., & Elkalmi, R. M. Are parents' knowledge and practice regarding immunization related to pediatrics' immunization compliance? a mixed method study. *BMC Pediatrics*, 2014. 14(1), 1-7.

[17] Hasan BA. Malocclusion and orthodontic treatment need and demand among 13-18 years students in Erbil city. Ph.D. thesis, college of Dentistry Hawler Medical University, Erbil, Iraq. (2010)