



## Factors affecting completion of routine childhood immunization in Riyadh city

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### Abstract

**Background:** Immunization of children has a significant effect on the prevention of two to three million child deaths annually. Delayed and incomplete administration of childhood vaccines raises the risk of diseases preventable by vaccinations, mortality and morbidity.

**Aim:** To investigate factors affecting completion of routine childhood immunization in Riyadh city.

**Sample:** A convenience sample of 400 parents.

**Design:** A descriptive cross-sectional correlation design was used to conduct the study.

**Sitting:** Out-patient waiting areas of the vaccine clinic at King Abdullah Specialized Children's Hospital.

**Tools:** Data were collected using four questionnaire sheets included demographic profile, parents' knowledge regarding childhood immunization, the environment and health services sheet and modified survey of Parent Attitudes about Childhood Vaccines (PACV) sheet.

**Results:** Nearly half of parents had a Bachelor' degree. The mean age of the parents was 32.4 years. Nearly half of children were males. Two third of parents were living in urban areas and most of them had a vaccine clinic in their neighborhood. There was a highly significant difference between completion of child's vaccine and parents' knowledge. More than half of the parents were delayed their child's vaccine. The main reasons for delaying or incompleting the child's vaccine were forgetting vaccine time, sickness of child, inadequate information about the benefit and fear from vaccine side effect. There was a high statistical significance between parents' attitudes, beliefs about safety and efficacy of immunization, the level of hesitancy and the completion of their childhood vaccine.

**Conclusion:** Parental age, occupation, knowledge, hesitancy in the safety and efficacy of immunizations have been vital and crucial factors affecting the onset and completion of child vaccination; the current study recommended that conduct out an educational intervention study; to support hesitating parents who delayed their childhood vaccination, to improve their behavior towards children Immunization.

**Keywords:** Childhood immunization, factors affecting completion, parent attitudes about childhood vaccines, safety and efficiency, level of hesitancy

### Introduction

Immunization of children has a significant effect in preventing two to three million child deaths each year [1]. Vaccines are nowadays confirmed as a protection instruments, specifically against vaccines-preventable diseases. World health organization defines vaccines as "a biological preparation that improves immunity to a particular disease". Vaccinations conserve lives, prevent disability, and eradicate many diseases if global vaccination coverage improves, an additional 1.5 million deaths could be prevented. As a direct result of worldwide immunization [2].

Nearly 123 million infants worldwide, 9 out of 10, received at least one dose of Diphtheria-Tetanus-Pertussis vaccine in

2017, protecting them from infectious diseases that could cause serious illness, disability or be fatal, according to the latest WHO and UNICEF estimates of immunization. In the last five years, the percentage of children who received the three doses of diphtheria-tetanus-pertussis as primary vaccination schedule is sustained at 85% [3].

Worldwide, Tuberculosis, smallpox, and poliomyelitis has completely eradicated by vaccination. WHO estimated that Immunization will avert 2 to 3 million deaths every year from diphtheria, tetanus, pertussis, and measles. This communicable disease was a major children killer, and considered one of the most contagious diseases, one case is enough to cause concern

in a community. These diseases and others spread quickly among people who are not immune [4]. Strategic Advisory Group of Experts advice WHO to define the major barriers and issues to achieve and sustain high immunization coverage those obstacles to achieve full immunization coverage are not only technical but also include managerial, systems, socio-behavioral, financial, and communications. [6]

Childhood vaccination is a global health practice that saves children's lives and prevents diseases. According to WHO, vaccine hesitancy is one of the 10 leading threats to global health [40]. So children vaccination is the responsibility of everyone such as government, health care providers, parents, families, and communities all can contribute in conserve lives through immunization to decrease the number of communicable-vaccinated diseases among children, the professional nurse should investigate the reasons for incomplete vaccinations [2].

#### **Significant of the study**

While there has been considerable growth in vaccination coverage in developed countries over the past few decades, low full complete vaccination levels still raise a problem [8]. [7] reported that immunization status of children affected by factors related to child, parents, and health care services. [8]; [9] documented that the parents' education child order influences immunization completion and it considered as a major barrier to complete immunization. Furthermore, if the health center is distant from family living place, it will be hard to take their children for every dose. The most common factor related to parents that influence completeness of immunization of children are parent's knowledge and attitude regarding vaccination [8]; [10].

Parents have insufficient knowledge regarding vaccine preventable disease, need for multiple doses, when and where they take it, fear of adverse effect and false perceptions about contraindication, or parents perceive vaccine as ineffective way to prevent diseases [11] However, parent's knowledge is not only lack of information it could be misconception about vaccination's side effects. one of causes of withholding vaccines is parents think their children gets ill after give vaccines [12].

Others parental factor that can influence immunization status of children include socioeconomic status, working mothers and family characteristic such as large family [7] Social impact is also play an important role in parent's decision regarding childhood immunizations. The researcher found that most of parents tend to observe peer's behaviors as reference for their decision especially for new vaccinations [13]. Moreover, there are other factors related to health care services such as long distance and geographical access, lack of resources, lack of trained personal, health worker's behaviors and attitudes, improper communications and information between health care workers and families regarding follow up visit, next visit appointment, and long waiting time [10].

Several studies have documented that delayed and incomplete administration of childhood vaccines raises the risk of vaccine-preventable diseases, the mortality and morbidity. [5] Many countries face challenges to implement immunization programs. They are not only face challenges to introduce new vaccines, but to achieve a complete immunization for those already in the program [1]. In Canada, around 20% of parents

are concerned about giving their children the childhood vaccination. The parent's hesitancy contributed to decrease children vaccination with the spread of many diseases that can be prevented through vaccination [36] In addition, study was done in Emirates shows the reason of delay child vaccination is about the side effect and the safety of the vaccine [37].

In Saudi Arabia, there is 15.5% of the parent who has shown some of the vaccine hesitancy and (2.5%) who delay or dropped due to misinformation and doubts about vaccine importance and safety on the children health [41]. As well as a study was conducted at King Khalid University Hospital, Riyadh shows that the reason for delayed vaccination is negative beliefs toward vaccination, they believe that the vaccines are ineffective [38]

On the same line, despite the availability of free vaccination services at all vaccine Clinic in Riyadh, Saudi Arabia, some parents were late in taking their children for vaccination [22]. The coverage of Diphtheria, Tetanus and Pertussis (DTP) vaccine in Saudi Arabia were 96% However, number of pertussis cases reports increase from no cases in 2013 to 21 cases in 2017, [15]. In the same context the Ministry of Health in Saudi Arabia reported that the incidence rate of Measles increases from 0.5 in 2014 to 3.46 in 2018 and pulmonary Tuberculosis cases for people who was younger than 15 years old were 36 cases in 2015 and in 2018 the cases increased to 46 cases [16].

Saudi parents sometimes struggle to obey the plan in a timely manner and do not completely understand the importance of immunization except that it is compulsory for birth certification and school enrollment [18]. and still had concerns about safety and efficiency of vaccination which liable to hesitancy and delayed their childhood vaccine, [39]. Thus, the aim of this study was to investigate factors affecting completion of routine childhood immunization.

#### **Aim of the study and study objectives**

Identify factors that affecting completion of routine childhood immunizations in Riyadh city.

#### **Study subjects**

A convenience sample of (400) parents. Inclusion criteria of the participants who included: (1) All Saudi Parents having at least one child aged 0-9 years at the time of study agree to participate in this study after reading informed consent. Exclusion criteria included: non-Saudi parents.

#### **Methods**

##### **Study design**

A descriptive cross-sectional correlation design was used to describe the factors affecting the completion of routine childhood immunization in Riyadh City.

##### **Study setting**

Data collection for this study taken place in out-patient waiting areas of the vaccine clinics at King Abdullah Specialized Children's Hospital. The Data collection was conducted over four months extending from December 2017 till March 2018.

### Sample size

Using sample size calculator software, the sample size for the current Riyadh study estimated the total population of children between 0-9 years of age in the Kingdom of Saudi Arabia [24]. With confident level of 95% and confidence interval of 5% the estimated sample size was 385 [20]. The researcher increased the overall sample to 400 Saudi parents in order to ensure representation of the entire population.

### Ethical consideration

The ethical approval taken by permission from the research unit in the college of nursing and the King Abdullah International Medical Research Center (KAIMARC) in Riyadh to take the Institutional Review Board (IRB). Anonymity of the participants in this study assured. The participants assured of their right to privacy, no name or personal data included in questioner, and all data saved in a password-protected personal computer belong to the researchers. The right of voluntary participants mentioned and assured in the informed consent. Moreover, the right to withdraw from study assured at any time. All participants signed an informed consent included comprehensive information about the purpose, benefit, and risk, and confidentiality before participating.

### Data collection methods, instruments used, measurements

The data had been collected through a questionnaire administered on its own. They had the questionnaire distributed; the instrument taken approximately 10 to 15 minutes. If the parents could not read and write the researchers facilitated reading and writing to complete the questionnaire.

The instrument consisted of 4 parts as following:

#### Part I: Demographic characters of the parents and their children

The questions developed by the researchers, it included 17 items about parents and their children demographic data such as age, relation to child, education level, work, child sex, child order in the family, type of deliver and where, child birth weight, health problem....etc.

#### Part II: Parents' knowledge assessment sheet

The questions prepared by the researcher consisted of 7 items about parents' general information and knowledge regarding childhood immunization and details of vaccination timeliness based on the primary vaccination schedule in Saudi Arabia. The researcher identified delayed vaccination when parents had taken their children to the vaccine clinic more than one month after the scheduled date of the vaccine.

#### Part III: Environment and health services sheet

The researcher designed the environment and health services sheet that affecting completion of childhood vaccinations, It consisted of 5 items about: living place, accessibility to health services, mode of transportation, time to reach to health services, and waiting time in health services.

#### Part V: Parent attitudes about childhood vaccines survey PACV [21]

The PACV survey used to identify hesitancy parents who had concerns about vaccines and beliefs about safety and

efficacy, immunization behaviours. The researchers modified the PACV survey after taking approval from the author, the total modified PACV survey consisted of 12 items divided into 3 main section:

1. The immunization behaviors, which included 4 items.
2. The parental attitudes and beliefs about safety and efficiency, which included five items.
3. The general attitude of parents to trust in health care workers, which included three items.

The modified PACV survey had different response formats on a Likert scale (e.g., yes/no/ don't know); a five point Likert scale (e.g., strongly agree, agree, not sure, disagree, strongly disagree), (e.g., Not at all concerned, not too concerned, not sure, somewhat concerned, very concerned) and (e.g., Not at all hesitant, Not too hesitant, Not sure, somewhat hesitant, Very hesitant)

The modified survey was in English language, the researchers translated it to Arabic by native professional. The Arabic version of the survey was piloted on five native Arabic speaking adults to test the feasibility and applicability of the tool.

The researchers did pilot study for 10% of total sample to assess validity of the tool (the pilot study excluded from the total sample). The face validity test was carried out by giving the tool to 3 faculty to revise it. To calculate the tool's reliability, Cronbach's alpha was estimated by researchers at 70%

### Scoring system

For parents' knowledge, each correct answer response had "2" scores, the "Don't Know" response had "1" score, and the "incorrect" response had zero. The total score was 16 converted to 100%, then categorized as follows:

- Excellent /Very good (75% to 100%)
- Good (60% to < 75%)
- Pass (60% to <65%)
- Fail < 60%

As regards the modified PACV survey

Responses to PACV were clustered into three main categories: hesitating responses received score "2," not sure or don't know the responses received score "1" and not-hesitating responses received score "0":

1. For the 3 items reflected positive attitude with a five-point Likert scale ranging from strongly agreed to strongly disagreed, hesitant responses corresponded to cluster responses of strongly agreed / agreed.
2. For the 2 items reflected negative parents' attitude with a five-point Likert scale ranging from strongly agreed to strongly disagreed, hesitant responses corresponded to cluster responses of strongly disagreed / disagreed.
3. For the 2 items reflected positive parents' attitude with a five-point Likert scale ranging from not at all concerned, very concerned, hesitant reactions corresponded to cluster reactions of somewhat concerned or very concerned.
4. For the 1 item reflected positive parents' attitude with a five-point Likert scale ranging from not at all hesitant to very hesitant, hesitant reactions corresponded to cluster reactions of somewhat hesitant, very hesitant. When the non-hesitant response was not at all hesitant and not too hesitant,

5. For the 4 items reflected positive parents' attitude with a five-point Likert scale ranging from yes / no / don't know. "No" reactions were considered to be hesitant and "Yes" the non-hesitant.

The total score was 36, converted to 100 percent by the researchers, and then categorized as:

- Less than 50% of the population was perceived not to be hesitant.
- 51-79% was considered a moderate level of hesitancy.
- 80-100% was considered to be a high level of hesitancy.

**Data management and analysis plan**

For Windows, data analysis is performed using SPSS version20. Descriptive statistics as percentage, mean, number of frequencies and standard deviation to describe the sample characters. In addition, correlations were rendered using the chi-square test for categorical variables, to assess the relationship between demographic sample data and parental and child factors, health services factors, and childhood immunization completeness. Significant level  $p < 0.05^*$

**Results**

**Part I: Demographic characters of the parents and their children**

**Table 1:** Parents demographic data in percentage distribution (n=400)

Items	NO	%
<b>Gender</b>		
Female	266	66.5
Male	134	33.5
<b>Age</b>		
Mean age	32.40	
Std. Deviation	6.22	
<b>Social status</b>		
Married	385	96.2
Divorced	11	2.8
Widowed	4	1.0
<b>Educational level</b>		
Illiterate	12	3.0
Primary - school	56	14.0
Secondary school	122	30.5
Bachelors' degree	190	47.5
Post graduate studies	20	5.0
<b>Work status</b>		
Unemployed	185	46.2
Employee	215	53.8

Table (1) revealed that two third of parents (66.5%) were female. The mean age of the parents was 32.4 years. The most of parents were married (96.2%). Nearly half of Parents (47.5%) had Bachelor' degree. More than half of parents were employed (53.8%).

**Table 2:** Children demographic data in percentage distribution (n=400)

Items	NO	%
<b>Gender</b>		
Boy	208	52
Girl	192	48
<b>Developmental age</b>		
Newborn	21	5.25
Infant	94	23.5
Toddler	153	38.25
Preschooler	71	17.75
School age	61	15.25
Mean ± SD	36.41 + 29.880 Month	
<b>Child order in family</b>		
First	115	28.8
Second	59	14.8
Third	72	18.0
Fourth	58	14.5
Fifth and more	96	24
<b>Type of delivery</b>		
Normal vaginal delivery	296	74.0
Caesarean section	104	26.0
<b>Place of delivery</b>		
House	6	1.5
Hospital	394	98.5

<b>Child birth weight</b>		
Normal birth weight	281	70.2
Low birth weight	89	22.2
Very low birth weight	14	3.5
Extremely low birth weight	12	3.0
Macrosomia	4	1.0
<b>Health problem</b>		
Healthy child	253	63.29
Acquire disease e.g. (Asthmatic /diabetes / leukemia)	78	19.5
Congenital anomalies e.g. (Cardiac / CNS)	69	17.25

Table (2) clarified that more than half of children were boys (52%) Nearly one third of children were in toddler age (38.25%), the mean ages were 36.41months. More than one quarter of children were the first child in the family. The most of children were delivered in hospital. The majority of

children were born with normal birth weight (70.2%). Nearly two third of children were in healthy status (63.29%)

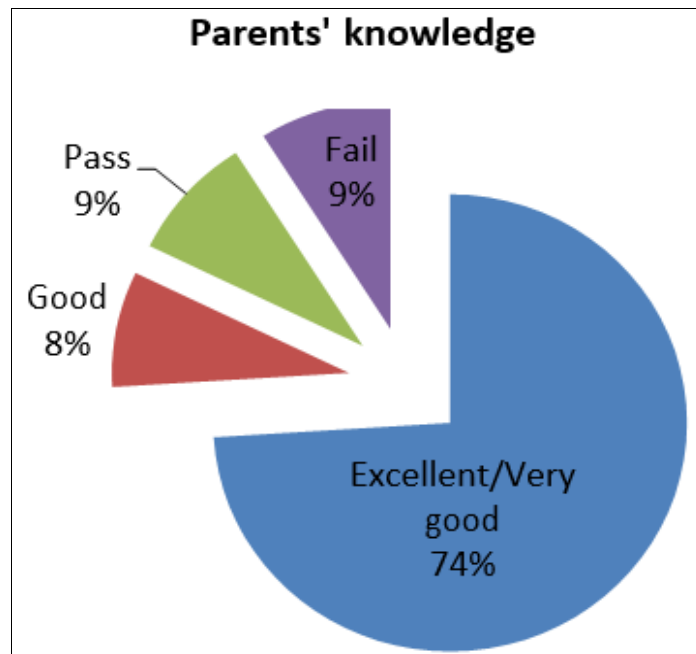
**Part II: Parents’ knowledge assessment sheet**

**Table 3:** Parents' knowledge regarding childhood immunization in percentage distribution (n=400)

Items	NO	%
<b>Do you know the names of the diseases your child has been immunized against?</b>		
Yes	281	70.2
No	70	17.5
Don't know	49	12.2
<b>Do you know about the benefits of childhood immunization?</b>		
Yes	296	74.0
No	76	19.0
Don't know	28	7.0
<b>Do you always come by the date of your child's vaccine according to the schedule?</b>		
Yes	191	47.75
No	209	52.25
<b>Based on your knowledge do you intend to complete your child's vaccine as scheduled?</b>		
Yes	296	74.0
No	76	19.0
Don't know	28	7.0
<b>What is the main reason that your child's vaccine is delayed or incomplete?</b>		
Forgetting vaccine time	193	48.2
Sickness of child	132	33.0
Lack of information about the benefit and fear from vaccine side effect	40	10.0
Social engagement	35	8.8
<b>What is your Source of information regarding childhood immunization?</b>		
Medical staff	317	79.2
Relative	43	10.8
Social media	32	8.0
Television	6	1.5
Newspapers and magazines	2	0.5
<b>What are the main side effect that your child usually has after vaccination?</b>		
Fever, mild swelling and redness at site of injection	320	80.0
Sleep problem	33	8.2
Rash	32	8
Diarrhea	15	3.8
Mean ± SD	11.75 ±.58549	

It was clear from table (3) that nearly three-quarters (74%) of the parents intended to complete their child's vaccine on time and only nineteen percent had not expected to complete. Over half of the parents delayed the vaccine for their child (52.25%). The main reasons for delaying or incompleting the child's vaccine were forgetting vaccine time, sickness of child (48.2%, 33% respectively). Only

10% of the parents still had inadequate information about the benefit and fear from vaccine side effect of vaccine. Medical staff was the main source of information on childhood immunization (79.2%) the most common side effects (80.0%) that the child usually had after vaccination were fever, mild swelling and redness at the injection site. The main score of parents' knowledge was 11.75±.58549.



**Fig 1:** Showed that almost three-quarters (74%) of parents had an excellent and very good grade

**Table 4:** Timeliness of vaccination details based on the primary vaccination schedule in relation to the gender of the child (n=400)

Time of vaccine category	On time of child vaccine				*Delayed of child vaccine			
	Boy		Girl		Boy		Girl	
	NO	%	NO	%	NO	%	NO	%
After delivery vaccine	8	2	1	0.25	6	1.5	10	2.5
2 Month vaccine	4	1	5	1.25	4	1	8	2
4 Month vaccine	3	0.75	0	0	12	3	12	3
6 Month vaccine	3	0.75	2	0.5	8	2	8	2
9 Month vaccine	2	0.5	8	2	10	2.5	10	2.5
12 Month vaccine	19	4.75	9	2.25	15	3.75	13	3.25
18 Month vaccine	6	1.5	7	1.75	22	5.5	19	4.75
2 years vaccine	28	7	26	6.5	24	6	18	4.5
4-6 Years vaccine	28	7	32	5.75	6	1.5	4	1
Total	101	25.25	90	22.5	107	26.75	102	25.5
chi-square test	N = 191-47.75%				N = 209-52.25%			
	X <sup>2</sup> = .640 P = 0.424							

\*Delayed vaccination when the parents brought their children to vaccine clinic more than one month after the scheduled date of vaccine

Table (4) illustrated that only less than half of the parents (47.75%) showed up on time according to primary vaccination schedule, there was no significant difference between the timing of vaccination based on the primary

vaccination schedule and the gender of the child.

**Part III: Environment and health services sheet**

**Table 5:** Environmental and health services regarding childhood immunization in percentage distribution (n=400)

Factors	NO	%
<b>Living place</b>		
Urban	266	66.5
Rural	134	33.5
<b>Do you have a vaccine clinic in your neighborhood?</b>		
Yes	326	81.5
No	74	18.5
<b>Type of transportation</b>		
Car	324	90.5
Limousine	30	7.5
Walk	8	2
<b>Time taken to reach pediatric hospital</b>		
5-30min	299	74.75
35-60min	87	21.75
More than 60min	14	3.5

Mean ± SD	30.86±21.825	
<b>Time taken in waiting area of out-patient</b>		
5-30min	199	49.75
35-60min	166	41.5
More than 60min	35	8.75
Mean ± SD	45.64±32.874	

Table (5) highlighted that, two third of parents were living in urban areas north of Riyadh (66.5%), most of the parents (81.5%) had a vaccine clinic in their neighborhood. The most of them (90.5%) used their cars as a type of transport.

The Mean of time in waiting area of the outpatient was 45.64 minutes.

**Part V: Parent attitudes about childhood vaccines**

**Table 6:** Parents' immunization behaviors association with completion of child vaccine according to schedule (n=400)

Items	Parents' completion of their childhood vaccine			Total N (%)	P value
	YES N (%)	NO N (%)	Don't know N (%)		
	Going to follow the routine schedule of vaccines is a good idea for my child.				
Yes	215(53.75)	49(12.25)	17(4.25)	281(70.2)	0.006*
No	43(10.75)	21(5.25)	6(1.5)	70(17.5)	
Don't know	38(9.5)	6(1.5)	5(1.25)	49(12.2)	
Following the routine schedule of vaccines will lead to disease prevention and enhance the immunity of my child.					
Yes	284 (71)	62(15.5)	22(5.5)	368 (92)	0.000*
No	12(3)	14(3.5)	6(1.5)	32 (8)	
If you have another baby today, you would like him / her to get all the necessary vaccine					
Yes	284(71)	66(16.5)	23(5.75)	373(93.2)	0.008*
No	5(1.25)	4(1)	2(0.5)	11(2.75)	
Don't know	7(1.75)	6(1.5)	3(0.75)	16(4.0)	
How hesitant about childhood vaccine would you consider yourself to be?					
Not at all hesitant	195(48.75)	42(10.5)	11(2.75)	248(62.0)	0.007*
Not too hesitant	67(16.75)	16(4)	10(2.5)	93(23.2)	
Not sure	17(4.25)	12(3)	2(0.5)	31(7.8)	
Somewhat hesitant	13(3.25)	3(0.75)	4(1)	20(5.0)	
Very hesitant	4(1)	3(0.75)	1(0.25)	8(2.0)	

Table (6) found that almost 70.2% of parents knew that the routine schedule of vaccines was a good idea for their children 53.75% of them completed their childhood vaccine on schedule. 92% of parents were fully aware that routine vaccination prevents diseases and enhance the immunity of their children, 71% of parents were trying to complete their childhood vaccine on schedule. 93.2% will give all vaccines to their future child. Two-thirds

of parents (62%) not at all hesitant to give their children vaccine and almost one-third of parents (31%) not sure, only 8% of parents are very hesitant to complete their childhood vaccine on schedule. There was a high statistically significant difference between all parent immunization behaviors and the completion of the child vaccine on schedule  $P < 0,05$  \*.

**Table 7:** Parents' attitude and, beliefs about safety and efficiency, of immunization association with completion the child's vaccine according to schedule

Items	Parents' completion of their childhood total vaccine			Total N (%)	P value
	Yes N (%)	No N (%)	Don't know N (%)		
	<b>My child's better off developing immunity by getting sick</b>				
Strongly disagree	174 (43.5)	36 (9)	12 (3)	222 (55.5)	0.006*
Disagree	66 (16.5)	19 (4.75)	14 (3.5)	99 (24.8)	
Not sure	42 (10.5)	11 (2.75)	0 (0)	53 (13.2)	
Agree	9 (2.25)	7 (1.75)	1 (0.25)	17 (4.2)	
Strongly agree	5 (1.25)	3 (0.75)	1 (0.25)	9 (2.2)	
<b>My child's better off not having any vaccines</b>					
Strongly disagree	98 (24.5)	20 (5)	3 (0.75)	121 (30.2)	0.03*
Disagree	80 (20)	16 (4)	9 (2.25)	105 (26.25)	
Not sure	68 (17)	17 (4.25)	12 (3)	97 (24.25)	
Agree	28 (7)	13 (3.25)	2 (0.5)	43 (10.8)	
Strongly agree	22 (5.5)	10 (2.5)	2 (0.5)	34 (8.5)	
<b>I think the child's body cannot tolerate a lot of vaccines</b>					

Strongly disagree	41 (10.25)	18 (4.5)	0 (0)	59 (14.8)	0.003*
Disagree	98 (24.5)	23 (5.75)	5 (1.25)	126 (31.5)	
Not sure	101 (25.25)	20 (5)	12 (3)	133 (33.2)	
Agree	44 (11)	7 (1.75)	8 (2)	59 (14.8)	
Strongly agree	12 (3)	8 (2)	3 (0.75)	23 (5.8)	
<b>Do you feel concerned about the serious side effect your child may have</b>					
Not at all concerned	82 (20.5)	31 (7.75)	5 (1.25)	118 (29.5)	0.008*
Not too concerned	64 (16)	8 (2)	3 (0.75)	75 (18.8)	
Not sure	28 (7)	11 (2.75)	1 (0.25)	40 (10.0)	
Somewhat concerned	99 (24.75)	20 (5)	13 (3.25)	132 (33.0)	
Very concerned	23 (5.75)	6 (1.5)	6 (1.5)	35 (8.8)	
<b>Do you feel concerned that one of vaccine is not safe</b>					
Not at all concerned	99 (24.75)	31 (7.75)	5 (1.25)	135 (33.8)	0.036*
Not too concerned	74 (18.5)	9 (2.25)	6 (1.5)	89 (22.2)	
Not sure	35 (8.75)	11 (2.75)	2 (0.5)	48 (12.0)	
Somewhat concerned	74 (18.5)	17 (4.25)	11 (2.75)	102 (25.5)	
Very concerned	14 (3.5)	8 (2)	4 (1)	26 (6.5)	

Chi-square test significant at  $P < 0.05$ \*

Table (7) illustrated that the most of parents strongly disagree and disagree that it was better for their children to develop immunity by getting sick (55.5%, 24.8% respectively) and only 17% of them agree. Nearly one third of the parents (30.2%) believed that it was better for their children did not receive any vaccine. 33.2% of parents not sure that the child body can tolerate many of vaccine, one

third of the parents somewhat concerned that their children might have serious side effect and more one quarter of parents somewhat concerned and very concerned that one of vaccine was not safe (25.5%, 6.5% respectively). There was a high statistical significance between parents' attitudes and beliefs about safety and efficiency and the completion of their childhood vaccine according to schedule \*  $p < 0.05$ \*

**Table 8:** Parents' general attitude about trust in health care worker association with completion of their childhood vaccine according to schedule

	Parents' completion of their childhood vaccine			Total N (%)	P value
	Yes N (%)	No N (%)	Don't know N (%)		
<b>I trust the information that I received from health care worker</b>					
Strongly disagree	11 (2.75)	2 (0.5)	0 (0)	13 (3.2)	0.586
Disagree	5 (1.25)	0 (0)	1 (0.25)	6 (1.5)	
Not sure	24 (6)	5 (1.25)	1 (0.25)	30 (7.5)	
Agree	72 (18)	16 (4)	10 (2.5)	98 (24.5)	
Strongly agree	184 (46)	53 (13.25)	16 (4)	253 (63.2)	
<b>I am able to openly discuss my concerns about vaccine with my child's doctor</b>					
Strongly disagree	10 (2.5)	2 (0.5)	0 (0)	12 (3.0)	0.981
Disagree	7 (1.75)	3 (0.75)	1 (0.25)	11 (2.8)	
Not sure	21 (5.25)	4 (1)	2 (0.5)	27 (6.8)	
Agree	72 (18)	18 (4.5)	7 (1.75)	97 (24.2)	
Strongly agree	186 (46.5)	49 (12.25)	18 (4.5)	253 (63.2)	
<b>I am satisfying with care that medical staff offer</b>					
Yes	149 (37.25)	47 (11.75)	10 (2.5)	206 (51.5)	0.014*
No	139 (34.75)	6 (1.5)	15 (3.75)	178 (44.5)	
Don't know	8 (2)	5 (1.25)	3 (0.75)	16 (4)	

Chi-square test significant at  $P < 0.05$ \*

It was clear from the table (8) that the majorly of parents trusted the information that their received from health care worker and discussed their concerns with doctors (agreement strongly 63.2% and agree 24.5%). Nearly half of parents (51.5%) satisfied with care that medical staff

offered. There was a statistically significant with between parents' satisfaction and completion of their childhood vaccine according to schedule \*  $P < 0.05$

**Table 9:** The Mean score of overall 12- item parental PACV

Level of hesitancy	N	%
Not to be hesitant.	281	(70.2)
Moderate level of hesitancy.	70	(17.5)
High level of hesitancy.	49	(12.3)
Mean ± SD	58.49± 1.673	

Table (9) confirmed that almost one quarter of parents had

moderate to high levels of hesitancy reluctant to complete



their child vaccine. (17.5%, 12.3% respectively)

**Table 10:** Relationship between parents' completion of childhood vaccine according to schedule and multivariable

Variables	Parents' completion of their childhood vaccine
	P value
<b>Demographic characters of the parents and their children</b>	
Parents' age	0.001**
Parents' level of education	0.000*
Parents' occupation	0.04*
Gender of Children	0.83*
Childbirth weight	0.06*
Child order in family	0.44**
Child health status	0.21*
<b>Factors on the environment and health services</b>	
Living place	0.93*
Do you have a vaccine clinic in your neighborhood	0.89*
Time taken in waiting area of out-patient	0.88*
<b>Knowledge of parents</b>	
Mean Score of Parent Knowledge	0.000**
<b>Attitudes of parents</b>	
Mean score of parental hesitancy level	0.000**

\*Chi-square test, \*\*T- test

Table (10) highlighted that there was a statistically significant relationship between parent age, occupation, level of education and completion of childhood vaccine according to schedule

There was no statistically significant relationship between the child's gender, birth weight, order, health status, factors on the environment and parents' completion of their childhood vaccine. There was a high statistical significance between the mean parental knowledge score, the mean parental hesitancy score, and the parents completing their child's shots  $p=0.000^*$ .

**Discussion**

Current research found that nearly half of Parents were had Bachelor' degree. And minority of them had studied at a higher level, the same result was founded by [22] who studied 1000 parents to explore factors associated with delayed vaccination among children and concluded that, half of the participants had a bachelor's degree, and 3.2% had studied at a higher level. Also [9]. Documented that the education influences immunization completion. The results indicated that Children whose mothers have educational level primary and above are having better probability of being fully immunized by 8-14% ( $P<0.05$ ) compared to mothers with no education. The current study revealed that more than half of parents were employed, the mean ages for the parents were years. The results of the current study were on the same line [28] who assured that more than half of parents were employed and the mean age of parents 32.40 years. Furthermore, the results showed that there was statistically significant relationship among parents' education level, their age, occupation and completion of childhood vaccine according to schedule. the results in agreement with other study done in India to explore relationship between mothers' level of education and vaccination statues reported that improving mother health literacy could increase immunization coverage [24] also, there were more researches emphasized the significant influence of parent education level and immunization status of their children and found that parental education level was significantly and independently influence children's immunization status. [10,

25, 9, 8]. Also, the results of the current study were contradictory with [14] who found that the occupation of parents and their age were not significant at the close of the scheduled vaccination of their children.

Analysis of demographic characteristic of the children participated in the study showed that more than half of children were boys, nearly one third of children were in toddler age the mean ages were 36.41months. More than one quarter of children were the first child in the family. The results in agreement with [8]. That studied treatment knowledge, attitude and practice of the parents regarding child vaccinations in Arar, northern Saudi Arabia. And emphasized that, most children (40.1%) aged less than 6 years old, 58.9% were males, one quarter of children were the first child in the family.

The current study revealed that there was no significant difference between among child gender, vaccination timeliness and completion of childhood shots based on the primary vaccination schedule. However, the correlation between the child gender and the completion of child immunization on time based on the primary vaccine schedule varies in the literature. There were some studies showed that female gender was at risk of delay primary immunization as scheduled, compared to boy gender [26]. In other hand, in Saban, Malaysia studies found higher defaulter rate among boy gender [27].

This study did not show that birth weight was associated the completion of child immunization on time based on the primary vaccine schedule. However, there was a study have indicated that adherence to child immunization is Limited in low birth weight) [28]. Although birth order in this study is not significant associated. These results were contrasted with variety of research which reported that child birth order was associated with higher association with incomplete their vaccinations. Also, number of siblings in the family increase risk of incomplete or missed child [5, 29].

The current study revealed that three quarter of parents intended to complete their child vaccine according to schedule. Only nineteen percent did not plan to complete this result Similar to [23] who documented that the majority of participants had a strong intention to vaccinate and complete their children immunization according to schedule

and nearly twenty-two of them not intended to vaccinate and complete their children immunization.

In relation to vaccination timeliness more than half of parents came delayed to vaccinate their children according to Primary Vaccination Schedule. This result was contradictory with [22] who concluded in his study about factors associated with delayed vaccination in children that nearly one quarter of parents were delayed their childhood vaccination due to many reasons. according to the current study the main reasons for delaying the childhood vaccine, were forgetting vaccine time & sickness of child and only 10% of parents still had inadequate information about the benefit and fear from vaccine side effect of vaccine. In this context, [22, 8] found that the most common reason for late presentation was that sickness of child, followed by parents were busy to bring their children and parents had forgotten the date. In addition, study was done in Emirates shows the reason of delay vaccination is about the side effect and the safety of the vaccine [37]. However, other study reported that unavailability of vaccine was the main reason of delay it [30]. The current study results reported that the medical staff were the main Source of information regarding childhood immunization. This finding was in agreement with [8, 17, 23] who found that Medical staff main source of information for the parents about immunization, followed by TV and social media. The current study revealed that the most side effect that the child usually had after vaccination were fever, mild swelling and redness at site of injection. In this context, [23] documented that fever was the most adverse effect of vaccination followed by pain and redness.

The current study documented that the majority of parents live in urban areas at Riyadh city, there is no significant relationship between living place and completion of child immunization based on the primary vaccine schedule. In this context, Bbaale, 2013 [9], found that most of children in urban areas were fully immunized compared to the children in rural areas. In relation to transportation the current study reported that the most used means of transportations to access the vaccine clinic was the car. The mean time taken to reach the clinic was nearly half an hour and the Mean time in waiting area was nearly forty-five minutes. On the same line [31] reported that the mean time taken to reach the vaccine clinic was thirty minutes and documented that there was no significant between time taken to closest health care facilities and vaccination status for children.

These results were contrasted with [32] who found that most of mothers were walking to access the health facility. The mean time taken to reach the clinic was too long. Furthermore, if the health center is distant from family living place, it will be hard to take their children for every dose [9].

In relation to parents' immunization behaviors the majority of parents knew that the routine vaccine schedule is good idea for their children, and more than half 53.75% of parents intended to complete their childhood vaccine according to schedule, the most of parents recognized that routine vaccination prevent diseases and enhanced their children immunity. These findings were in agreement with [8] who studied 367 parents to explore the knowledge and attitude regarding childhood vaccination and emphasized that many parents considered that vaccinations are necessary for their children, most of them assumed that vaccination decreases

the risk of a child's illness, enhance immunity. The majorly understudied that vaccinations play a role in the safety of children. In this context, [33] documented that Sixty to ninety percent of parents were really well- informed in Saudi Arabia of about the health benefits of childhood vaccination. This current study documented that more than ninety percent of parents verbalized their intention to give recommended vaccines to their future baby, the current study revealed that nearly two third of parents Not at all hesitant to give their children vaccine. And nearly one third not sure, only 8% of parent very hesitant to complete their childhood vaccine according to schedule. In this context [34] reported that parents who recorded themselves not hesitant about childhood vaccine were 58.5%; 20% were very hesitant and another 20.6% not sure.

There was high statistically significant difference between all Parents' immunization behaviors and completion of their childhood vaccine according to schedule. These findings were in agreement with [23] who studied 2645 mothers about childhood vaccine hesitancy and acceptance among mothers in Canada, found that there was a high statistically significant difference between mothers' immunization behaviors and intention to vaccinate their infants.

In relation to parents' attitude and, beliefs about safety and efficiency, of immunization the current study revealed that most of parents strongly disagree and disagree that it was better for their children to develop immunity by getting ill (55.5%, 24.8% respectively) and only 17% agree. This result almost Similar to [34] who studied 546 parents to explore their attitudes and behaviors regarding childhood vaccination in Iraq and documented that 70% disagree and only 16.6% agree on developing immunity by getting sick. The current study's results reported that nearly one third of parents (30.2%) believed that it was better for their children do not receive any vaccine. 33.2% of parents Not sure that the child body can tolerate many of vaccine, one third of parents Somewhat concerned that their children might have serious side effect and more one quarter of parents Somewhat concerned and very concerned that one of vaccine was not safe. In this context [23], reported that 61.0 percent were concerned that after immunization, their child might have a serious negative event and 52.5 percent were concerned that infant vaccines might not always be secure and safe there were statistically significant with between safety concerns and their babies vaccine hesitancy.

Similarly [35], who documented inside their review articles about investigating the causes motivating parental vaccine refusal that the largest, reason parents give for avoiding vaccines for their children are vaccine safety concern and many parents claim that their children's natural immunity is stronger than that gained by vaccinations. The results of the current study were in accordance with [23, 34, 35], who reported that there was a high statistical significance between parents' attitude and, beliefs about safety and efficiency, and child vaccine completion as scheduled.

In relation to parents' general attitude about trust in health care worker the current study reported that most parents trusted the information received from health care workers to discuss their concerns with physicians. This explanation was in line with [35] who reported in his review that confidence and trust in health team are fundamental and expected will make parents feel safe and comfortable and help them

understand unworthy fear.

On the other hands, the current study documented that there were not statistically significant among trusted in health care worker, discussed their concerns with doctors and completion of childhood vaccine according to schedule. This result was contradictory with <sup>[23, 34]</sup>, who concluded that there was highly statistically significant between trust which received from health team and parents' completion their child's shots. The current study revealed that the majorly of parents satisfied with care that medical staff offered. This finding was in agreement with <sup>[23, 34]</sup> who reported that the majority of the parents believed the instructions they obtained regarding immunization

The current study showed that almost one-quarter of parents had moderate to high levels of hesitancy to complete their child vaccine, and that there was a high statistical significance between all mean parental hesitancy scores and parents completing their child's shots. The results of the current study were in accordance with, <sup>[23, 38]</sup> Those who reported that almost a quarter of parents delayed vaccination and were hesitant because they had negative beliefs about vaccination believed that the vaccines were ineffective. And this hesitancy had a negative effect on complete childhood immunization

#### Conclusion and recommendations of the research

Parental age, occupation, knowledge, hesitancy in the safety and efficacy of immunizations have been vital and crucial factors affecting the onset and completion of child vaccination; so, the researcher recommended the following

1. More awareness activities to raise education and change attitudes and practices to achieve a hundred percent and keep all vulnerable groups in perfect health.
2. Replicate the study of all Saudi cities
3. Conduct out an educational intervention study; to be assessed among vaccine-hesitant parents to ascertain whether there are any improvements in the parental attitudes towards vaccines assessed.

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