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Vaccine coverage DTP within the first year of life and associated vaccine _ preventable disease tetanus dipheria and pertussis within incomplete immunization

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Introduction

The DTaP vaccine series is recommended to help protect against diphtheria, tetanus, and pertussis in infants and young children. Individuals susceptible to these vaccine-preventable diseases can develop life-threatening complications and even death [1].

Tetanus is an infectious disease caused by neurotoxins produced by the gram-positive bacillus, *Clostridium tetani*. The heat-resistant spores of the bacteria enter the body at mucous membranes or a breach in the skin. Toxins are formed, including a highly potent toxin called tetanospasmin. This toxin interferes with the release of neurotransmitters in the central nervous system leading to unopposed muscle contraction and spasms [2].

Diphtheria results from infection with toxin-producing strains of *Corynebacterium diphtheriae*, (Figure 2).

Figure 1: Corynebacterium diphtheriae

A gram-positive bacillus. The disease is transmissible from person to person by droplets or close contact. The bacteria can multiply and produce the diphtheria toxin in the nasopharynx region, mucous membranes, or skin lesions. Early symptoms can include malaise, sore throat, and low-grade fever. A classic feature of respiratory diphtheria is a gray-colored pseudo-membrane that firmly adheres to the mucosal lining of the nasopharynx, tonsils, or larynx. This pseudo-membrane can extend further into the nasal cavity or larynx, obstructing the airways [3].

Pertussis is a respiratory disease, also known colloquially as whooping cough, caused by the gram-negative bacillus, *Bordetella pertussis* (Figure 3).

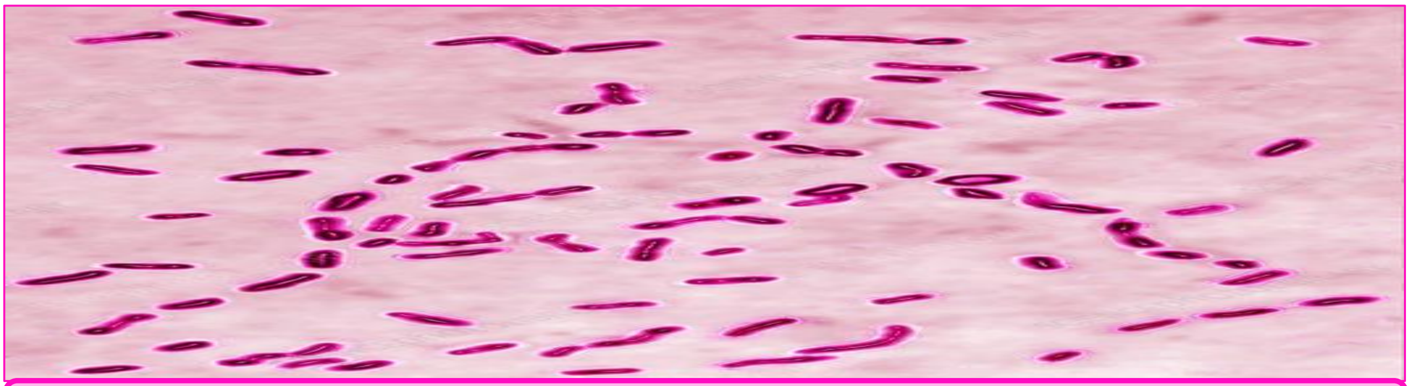


Figure 2:Bordetella pertussis, LM - Stock Image

The disease characteristically has three stages: catarrhal, paroxysmal, and convalescent [1]. The catarrhal stage includes symptoms of coryza, mild cough, and low-grade fever. Around one to two weeks, the infected person enters the paroxysmal stage with symptoms of spasmodic coughing, posttussive vomiting, and inspiratory whoop. Symptoms slowly improve in the convalescent stage but can last for weeks to months [4]. Immunization is one of the most effective public health interventions, leading to reduced infant and childhood mortality caused by vaccine preventable diseases worldwide[1]. Full immunization during infancy is essential to ensure protection against childhood life threatening infections [2]. The goal of Expanded Program on Immunization (EPI) established by the world Health Organization (WHO) in 1974 is to provide vaccination to all children globally against six initially targeted vaccine preventable diseases (severe infant tuberculosis, poliomyelitis, diphtheria, tetanus, pertussis and measles) [3]. The recognition of immunization as an important tool in reducing child mortality has led to the development of Global Vaccine Action Plan (GVAP); a framework to help countries achieve universal child immunization by 2020 with the target of ending preventable child death by 2030 as stated in the United Nations Sustainable Development Goals[4].

Vaccination has proved to be effective against diseases such as small pox, diphtheria, tetanus, pertussis, haemophilus influenza type B (Hib), pneumococcus infections, hepatitis A, hepatitis B, varicella, measles, rubella, polio and rabies. Rates of vaccine preventable diseases have been observed to be decreasing in many parts of the world in the past few decades though many children still remain unvaccinated [5].

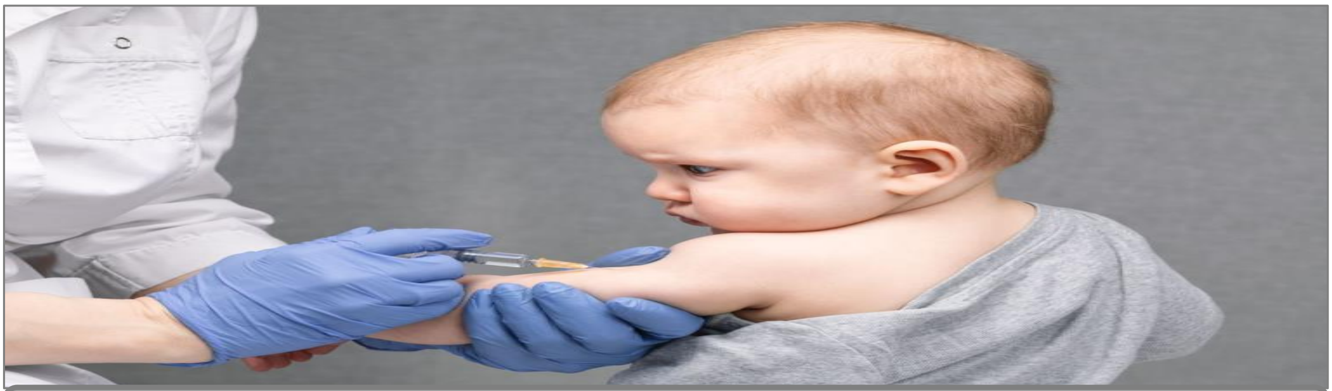


Figure 3: Program of DTP vaccine

vaccinations are the most cost effective method to reduce childhood morbidity and mortality with approximately 2.5 million vaccine preventable deaths occurring world-wide annually (WHO, 2013). In low- and middle-income countries, vaccine preventable diseases, such as measles and diphtheria, continue to cause morbidity and mortality, particularly among migrants, urban slum residents and those living in remote areas or with poor access to health facilities [6]. Vaccination coverage in these at risk groups is usually lower than in the general population. Vaccines were one of the greatest public health achievements in the twentieth century, being the safest and most cost-effective intervention to control infectious diseases[7, 8] . Still exist a high number of children with incomplete vaccination coverage, which represents a risk to the resurgence of diseases that are under control and to the reintroduction of those already eliminated [9].

Immunization coverage rates in Australian children are among the highest in the world, with over 90% of children receiving all recommended vaccines by the relevant age milestones [10, 11]. A number of factors contribute to this high uptake, including the comprehensive funding of the childhood immunization schedule by the government through the National Immunization Program (NIP), the Australian Childhood Immunization Register (recently expanded to all ages and renamed), which has tracked the vaccination status of children at an individual level since 1996;[10] and an adapted legislation preventing the collection of government family benefits and enrollment of children into childcare facilities without proof of immunization [11]. The national recommendations for vaccination are made by the Australian Technical Advisory Group on Immunization (ATAGI) and listed in the Australian Immunization Handbook (AIH) [12].

In the U.S., illnesses attributed to vaccine-preventable diseases have a higher prevalence among adults (≥19 years), compared to children (aged ≤12 years). Additionally, vaccination coverage among U.S. adults continues to be lower than the national goals. In 2017, 63.4% of U.S. adults aged ≥19 years reported having received any tetanus toxoid-containing vaccination within the last 10 years, with the vaccination rate decreasing with increasing age [13] .

Tetanus cannot spread from person to person and as a result, herd immunity with vaccination cannot be achieved. Prevention is therefore dependent on individual vaccination. For this reason, Healthy People 2020 focuses on the importance of sustaining tetanus vaccine coverage rates in the United States [2]. Tetanus vaccines are administered in many different settings, including routine physicals, at pregnancy appointments, or in high-risk situations such as experiencing an injury with laceration. Vaccination is the best form of protection from tetanus. However, over time, individuals may become re-susceptible to tetanus due to waning immunity. For this reason, a booster shot is required every 10 years [14].

Childhood immunization has proved to be the most important child survival strategy. Estimated to prevent between 2 and 3 million deaths each year, it is one of the most essential and cost-effective strategies to reduce childhood morbidity and mortality It is also one of the key elements of primary health care[15]. According to WHO estimation in 2008, 1.5 million deaths or 17% of global mortality in children under 5 years were due to only 6 Vaccine Preventable Diseases (VPDs) [15]. Despite the established health and economic benefits of childhood vaccinations [16]. child vaccination coverage, especially in developing countries, is still low VPDs continue to be a leading course of child under-five mortality in sub-Saharan Africa In 2016, an estimated 19.5 million infants did not have access to routine immunization services globally. About 60% of these children, live in 10 countries: Angola, Brazil, the

Democratic Republic of the Congo, Ethiopia, India, Indonesia, Iraq, Nigeria, Pakistan and South Africa[15].

Patient and method

The study begin from 9 on September to 10 on December this cross-sectional , multi-center study was conducted at the first and second primary health care of buhriz and primary health care of Hay al - Mustafa and from albatool teaching hospital were performed using data from population - based cohort . Information on vaccination status was collected from immunization cards and verbal mother's reports from 250(38 case from albatool teaching hospital; 76 from first primary health care center of buhriz; 86 from second primary health care center of buhriz; 50 from Hay al-Mustafa primary health care center) the child aged from 1 month to 5 years all information was collected in a questionnaire, which was attached at the end of research.

Result and Discussion

The results of my study that titled with (Vaccine coverage DTP within the first year of life and associated vaccine _ preventable disease tetanus dipheria and pertussis within incomplete immunization) showed that most of children complete the vaccination program at an age before entering school as show in table (1), percentage of (96.3%) received the vaccine during first six months and (100%) during first years.

Table (1): Distribution the children according to age period for receive the vaccination.

			Vaccination state		Total
			Vaccination	Non vaccination	
Age class	(1-6) month	Count	78	3	81
		% within Age class	96.3%	3.7%	100.0%
		% within Vaccination state	31.7%	75.0%	32.4%
	(7-12) month	Count	64	0	64
		% within Age class	100.0%	0.0%	100.0%
		% within Vaccination state	26.0%	0.0%	25.6%
	(13-24) month	Count	33	0	33
		% within Age class	100.0%	0.0%	100.0%
		% within Vaccination state	13.4%	0.0%	13.2%
	(25-36)	Count	23	1	24

	month	% within Age class	95.8%	4.2%	100.0%
		% within Vaccination state	9.3%	25.0%	9.6%
	(37-48) month	Count	35	0	35
		% within Age class	100.0%	0.0%	100.0%
		% within Vaccination state	14.2%	0.0%	14.0%
	(49-60) month	Count	13	0	13
		% within Age class	100.0%	0.0%	100.0%
		% within Vaccination state	5.3%	0.0%	5.2%
Total		Count	246	4	250
		% within Age class	98.4%	1.6%	100.0%
		% within Vaccination state	100.0%	100.0%	100.0%

The results also show that the percentage of vaccinated out of out the total number (250) of children reached (246), 98.4% as shown in figure (4). Statistical analysis appears (0.000) for children who received the vaccination program and who did not complete the program.

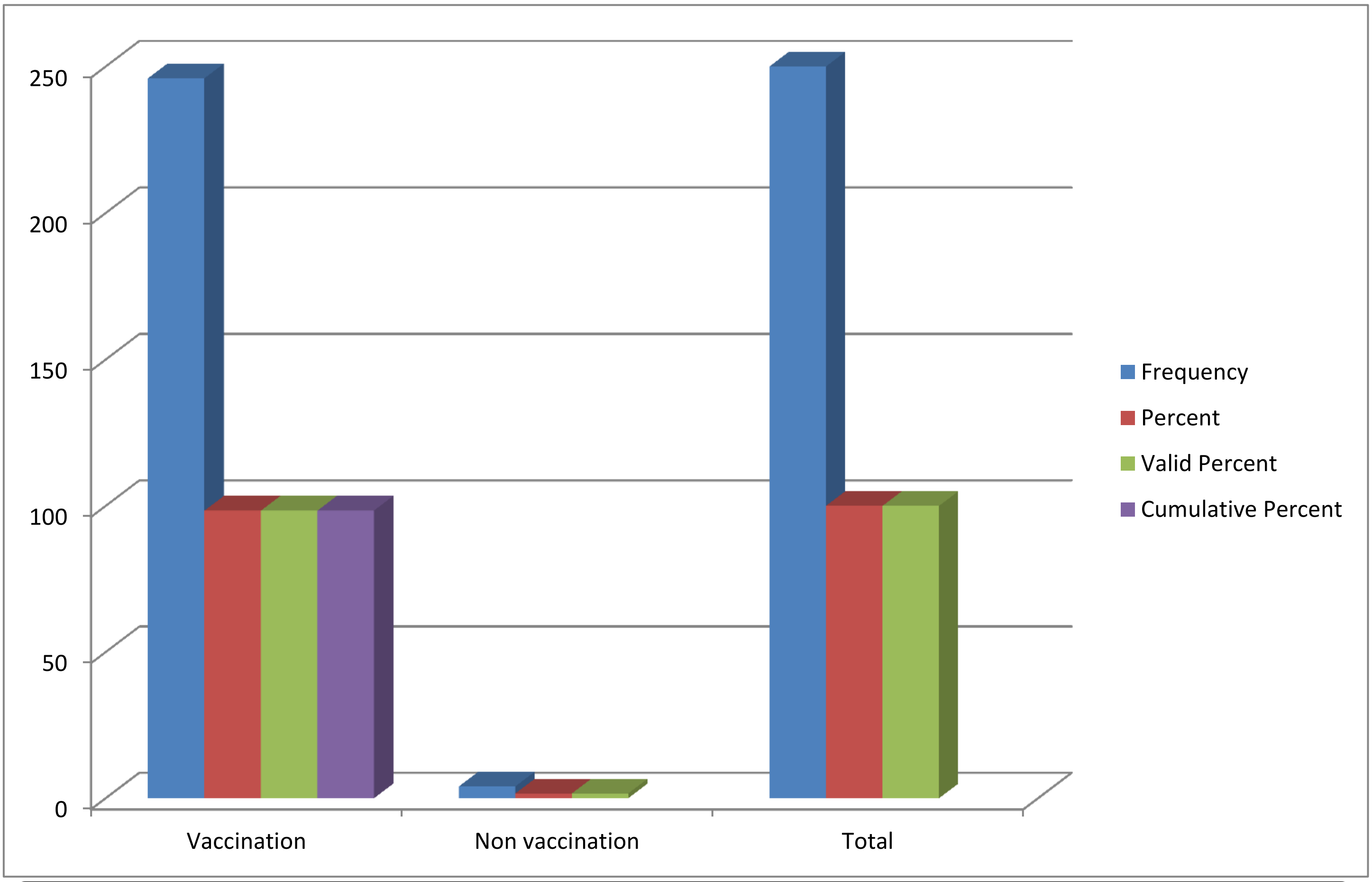


Figure 4: Vaccination state

Table (2): distribution the children depending on the geographical location.

			Location		Total
			Rural	Urban	
Age class	(1-6) month	Count	10	71	81
		% within Age class	12.3%	87.7%	100.0%
		% within Location	13.7%	40.1%	32.4%
	(7-12) month	Count	28	36	64
		% within Age class	43.8%	56.3%	100.0%
		% within Location	38.4%	20.3%	25.6%
	(13-24) month	Count	10	23	33
		% within Age class	30.3%	69.7%	100.0%
		% within Location	13.7%	13.0%	13.2%
	(25-36) month	Count	10	14	24
		% within Age class	41.7%	58.3%	100.0%
		% within Location	13.7%	7.9%	9.6%
	(37-48) month	Count	10	25	35
		% within Age class	28.6%	71.4%	100.0%
		% within Location	13.7%	14.1%	14.0%
	(49-60) month	Count	5	8	13
		% within Age class	38.5%	61.5%	100.0%
		% within Location	6.8%	4.5%	5.2%
Total		Count	73	177	250
		% within Age class	29.2%	70.8%	100.0%
		% within Location	100.0%	100.0%	100.0%

The significant difference appears clearly in the percentage of children who have fully completed the vaccination program in the city (urban) as show in table (2). This may be attributed to the availability of the health center and proximity to residential communities.

Table (3): distribution of the vaccine doses during first five years of life.

			Dose				Total
			No dose	First dose	Second dose	Third dose	
Age class	(1-6) month	Count	3	25	32	21	81
		% within Age class	3.7%	30.9%	39.5%	25.9%	100.0%
		% within Dose	75.0%	59.5%	52.5%	14.7%	32.4%
	(7-12) month	Count	0	11	16	37	64

		% within Age class	0.0%	17.2%	25.0%	57.8%	100.0%
		% within Dose	0.0%	26.2%	26.2%	25.9%	25.6%
	(13-24) month	Count	0	3	5	25	33
		% within Age class	0.0%	9.1%	15.2%	75.8%	100.0%
		% within Dose	0.0%	7.1%	8.2%	17.5%	13.2%
	(25-36) month	Count	1	2	3	18	24
		% within Age class	4.2%	8.3%	12.5%	75.0%	100.0%
		% within Dose	25.0%	4.8%	4.9%	12.6%	9.6%
	(37-48) month	Count	0	0	3	32	35
		% within Age class	0.0%	0.0%	8.6%	91.4%	100.0%
		% within Dose	0.0%	0.0%	4.9%	22.4%	14.0%
	(49-60) month	Count	0	1	2	10	13
		% within Age class	0.0%	7.7%	15.4%	76.9%	100.0%
		% within Dose	0.0%	2.4%	3.3%	7.0%	5.2%
Total		Count	4	42	61	143	250
		% within Age class	1.6%	16.8%	24.4%	57.2%	100.0%
		% within Dose	100.0%	100.0%	100.0%	100.0%	100.0%

The result of the study showed that the percentage of children received the dose of vaccine program during first five year of life were 30.9% , 17.2 % respectively as show in table (3) , and percentage of those who completed all doses before school age (100%).

Table (4): distribution of vaccinated and unvaccinated children according to diseases.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Family disease	2	.8	.8	.8
	No family disease	248	99.2	99.2	100.0
	Total	250	100.0	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disease	2	.8	.8	.8
	Non disease	248	99.2	99.2	100.0
	Total	250	100.0	100.0	

The genetic factor did not appear to play a major role in occurrence of certain injuries, as the questionnaire showed that there were no individual injuries or within the family as appears in table (4).

Table (5): distribution of children according age group and diseases.

			Disease		Total
			Disease	Non disease	
Age class	(1-6) month	Count	2	79	81
		% within Age class	2.5%	97.5%	100.0%
		% within Disease	100.0%	31.9%	32.4%
	(7-12) month	Count	0	64	64
		% within Age class	0.0%	100.0%	100.0%
		% within Disease	0.0%	25.8%	25.6%
	(13-24) month	Count	0	33	33
		% within Age class	0.0%	100.0%	100.0%
		% within Disease	0.0%	13.3%	13.2%
	(25-36) month	Count	0	24	24
		% within Age class	0.0%	100.0%	100.0%
		% within Disease	0.0%	9.7%	9.6%
	(37-48) month	Count	0	35	35
		% within Age class	0.0%	100.0%	100.0%
		% within Disease	0.0%	14.1%	14.0%
	(49-60) month	Count	0	13	13
		% within Age class	0.0%	100.0%	100.0%
		% within Disease	0.0%	5.2%	5.2%
Total		Count	2	248	250
		% within Age class	0.8%	99.2%	100.0%
		% within Disease	100.0%	100.0%	100.0%

Table (6): distribution of children according to family disease.

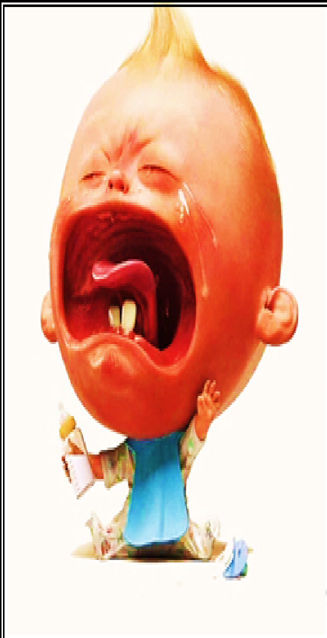
			Family disease		Total
			Family disease	No family disease	
Age class	(1-6) month	Count	2	79	81
		% within Age class	2.5%	97.5%	100.0%
		% within Family disease	100.0%	31.9%	32.4%
	(7-12) month	Count	0	64	64

		% within Age class	0.0%	100.0%	100.0%
		% within Family disease	0.0%	25.8%	25.6%
	(13-24) month	Count	0	33	33
		% within Age class	0.0%	100.0%	100.0%
		% within Family disease	0.0%	13.3%	13.2%
	(25-36) month	Count	0	24	24
		% within Age class	0.0%	100.0%	100.0%
		% within Family disease	0.0%	9.7%	9.6%
	(37-48) month	Count	0	35	35
		% within Age class	0.0%	100.0%	100.0%
		% within Family disease	0.0%	14.1%	14.0%
	(49-60) month	Count	0	13	13
		% within Age class	0.0%	100.0%	100.0%
		% within Family disease	0.0%	5.2%	5.2%
Total		Count	2	248	250
		% within Age class	0.8%	99.2%	100.0%
		% within Family disease	100.0%	100.0%	100.0%

Conclusion

There is a noticeable difference between rural and urban areas, as the number of children who do not adhere to the dates set for vaccination is more, although there is also non-compliance in urban areas, perhaps due to, the lack of awareness of the parents, few and far from existing health centers in the countryside and lack of campaigns and health awareness of the importance of vaccinations. Perhaps the doses should be completed at lower ages, as we found a child younger than the age specified for the first dose was infected.

Appendix



العنوان ///// القاح الثلاثي للاطفال ضمن عمر السنة

- منطقة سكن العائلة /// المدينة ☐ ريف ☐
- عمر الطفل /// ☐
- عدد جرعات القاح التي تلقاها الطفل جرعة اولى ☐ جرعة ثانية ☐ جرعة ثالثة ☐
- هل هناك اي اصابات مرضية ؟ نعم ☐ لا ☐
- نوع الاصابة ؟ الخناق ☐ السعال الديكي ☐ الكزاز ☐
- هل هناك اصابة سابقة او حالية لاحد افراد الاسرة باحدى هذه الامراض ؟ نعم ☐ لا ☐

Reference

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