

An Investigation on Prevalence of Side Effects of a New Pentavalent Vaccine in Two-to Six-Month-Old Children Referred to Health Centers in Ilam City

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ABSTRACT

Background and Objective: Vaccines are medical devices used for boosting the health of people, especially children. This study was performed to determine the prevalence of the side effects of a new pentavalent vaccine in 2- to 6-month-old children in Ilam.

Materials and Methods: This descriptive cross-sectional study was performed on 2-6-month-old children for inoculating the pentavalent vaccine. A questionnaire containing queries on the age of child, parents' education, contact number, injection date, gestational age, the underlying diseases, failure to thrive (FTT), and side effects (diarrhea, vomiting, nausea, redness, fever, intense crying, restlessness, drowsiness, stiffness, etc.).

Results: Of the children, 35.9% were two months old, 31.8% were four months old, and 32.3% were six months old. Boys and girls constituted 53% and 47% of children, respectively. Regarding mothers' education, 54.5% had lower than diploma degrees, and 6.1% had academic education. Regarding fathers' education, 13.2% had lower than diploma, and 12% had academic degrees. Most of the children (94.4%) had no underlying diseases, and 5.6% of them suffered from the underlying diseases including reflux (1.6%), anemia (2.3%), favism (0.9%), fever and convulsion (0.7%), and hypothyroidism (0.2%). The most common complications were fever (68.1%), skin redness (56.1%), pain (43.8%), and restlessness (24.7%). Fever (69.2% vs. 66.8%, $P>0.05$), skin redness (65.2% vs. 45.8%, $P<0.05$), vomiting (10.5% vs. 3.3%, $P<0.05$), and stiffness (6.6% vs. 3.3%, $P>0.05$) were more common in boys than girls, respectively. On the other hand, restlessness (35.8% vs. 14.8%, $P<0.05$) was significantly higher in girls than in boys.

Conclusion: According to our results, fever, skin redness, and pain were the most common complications. Fever was more common in 2-month-old boys, and pain was

more observed in 6-month-old girls. Most of the side effects were transient and disappeared upon a week. No remarkable contraindications were reported, confirming the safety of the vaccine.

Keywords: Complications, Vaccine, Pentavalent, Children, Vaccination.

1. Introduction

The health of all ages, especially the younger ones, is important due to the impact on a person's future [1, 2]. Vaccines are medical tools used to boost the health of people, especially children, so any concern about the effectiveness and safety of vaccines should be investigated. If distrust in the effectiveness of a vaccine increases, dangerous public health consequences may be ensued by people refraining from being vaccinated. It is important to investigate the side effects and effectiveness of newly developed vaccines, which are generally less studied. The vaccine is usually infused for children of 2, 4, and 6 months of age. To date, no vaccine has been 100% effective and safe for all people. Some people react to the antigen or other substances in the vaccine, and the pentavalent vaccine has also been reported to be associated with some side effects post-transfusion [3-7].

The purpose of the immunization side effects care system is to determine the incidence of any complication following receiving different vaccines, preventing these side effects, and minimizing their consequences. Obviously, the preparedness of a country's health system to respond to such complications can help to obviate their adverse consequences and improve vaccination efficiency and quality, which boosts the safety of recipients and the trust of the community in this valuable intervention [8-10].

Understanding the different types of unwanted complications of vaccines can help doctors to guide their patients properly and obviate their concerns in most cases. The pentavalent vaccine (i.e. Hib/DTp/HB) protects children against five diseases including diphtheria,

pertussis, paralysis, hepatitis B infection, and *H. influenzae* type 2 and exists in both liquid and lyophilized powder forms. However, due to the ease of use, only the liquid form is used in Iran. In urban areas, 10-dose vials and in rural areas, single-dose vials are distributed. Ten-dose vials can be applied up to one month after the first use if the instructions for the triple vaccine are followed. Each dose of the vaccine is 0.5 mL and is injected intramuscularly into the anterior outer segment of the left thigh by using an Auto-Disable (AD) syringe. The vaccine should be stored at 2-8 °C, and it should not be kept in a freezer. Before injection, its constituents should be shaken to ensure that they are not frozen. The vaccine has no serious side effects. However, itching, swelling, and pain at the injection site have been reported [11-15]. This study was conducted to determine the complications of the new pentavalent vaccine and their prevalence in children aged two to six months in Ilam.

2. Materials and Methods

2.1. Study design and statistical population

In this descriptive cross-sectional study, 576 children aged 2-6 month old referred to health centers in Ilam for infusing the pentavalent vaccine were enrolled.

2.2. Data collection instruments

The required information was gathered by using a researcher-made questionnaire, and based on the results of clinical investigations.

2.3. Study protocol

A questionnaire was used to collect data about the child's age, parents' education, a contact number, the injection date, gestational age at birth, underlying diseases of the child, failure to thrive (FTT), possible complications (diarrhea, vomiting, nausea, skin redness, fever, intense crying, restlessness, drowsiness, stiffness, etc.). The questionnaire was given to the parents of vaccinated children, who were requested to state any side effect after at least one week of vaccination.

2.4. Data analysis

After coding, the data was entered into and analyzed by SPSS 16 software using descriptive and analytical statistics (Fisher's exact and Chi-square tests). A P-value of <0.05 was designated as the significance level. The scientific validity of the questionnaire was determined by the content analysis method based on reviewing the literature and taking faculty members' suggestions.

2.5. Ethical considerations

This study was approved by the Ethics Committee of Ilam University of Medical Sciences. All data was coded and kept confidential (IR.MEDILAM.REC.1399.19).

3. Results

In this study, 2-, 4-, and 6-month-old children constituted 35.9%, 31.8%, and 32.3%, respectively, and 53% and 47% of the children were boys and girls, respectively. Majority of mothers (54.5%) had lower than diploma education, and 6.1% of them had academic education. Among fathers, 13.2% had lower than diploma, and 12% had academic education. In terms of height, 37%, 60.4%, and 2.6% of the children were belonged to the <25%, 50-25%, and 75-50% percentiles, respectively. In terms of weight, 35.1%, 59.4%, 4.2%, and 1.4% fell into the <25%, 50-25%, 75-50%, and >75% percentiles, respectively. Regarding the gestational age, 9.9% of the children were premature. In addition, 94.4% of the children had no underlying diseases, while the other 5.6% with underlying diseases included 1.6% with reflux, 2.3% with anemia, 0.9% with favism, 0.7% with fever and convulsion, and 0.2% with hypothyroidism. The results revealed that the most common complications were fever (68.1%), skin redness (56.1%), pain (43.8), and restlessness (24.7%) (Table 1).

Table 1. The frequencies of complications following vaccination with the pentavalent vaccine in the studied children

Complications	Frequency	Percentage
Fever	392	68.1
Pain	252	43.8
Convulsion	10	1,7
Restlessness	142	24.7
Anorexia	91	15.8
Diarrhea	47	8.2
Vomiting	41	7.1
Intense Crying	33	5.7
Skin Redness	323	56.1
Stiffness	35	6.1
Abscess at injection site	6	1
Abnormality in consciousness	3	0.5
Death	1	0.15

Fever (69.2% vs. 66.8%), skin redness (65.2% vs. 45.8%), vomiting (10.5% vs. 3.3%), and stiffness (6.6% vs. 3.3%) were more common in boys than girls (see Table 2).

Table 2. The distribution of complications following vaccination with the pentavalent vaccine in the studied children based on gender

Complications	Boys (%)	Girls (%)	P
Fever	66.8	69.2	0.3
Pain	45	42.6	0.31
Convulsion	1.5	2	0.45
Restlessness	35.8	14.8	0.001
Anorexia	15.9	15.7	0.52
Diarrhea	8.9	7.5	0.33
Vomiting	3.3	10.5	0.001
Intense Crying	6.3	5.2	0.36
Skin Redness	45.8	65.2	0.001
Stiffness	5.5	6.6	0.36
Abscess at injection site	1.1	1	0.6
Abnormality in consciousness	0.4	0.7	0.54

Fever was significantly more common in 2-month-old children (76.3%) compared with other age groups. Skin redness (60.9%) and stiffness (7.2%) were also more frequent in 2-month-old children ($P>0.05$). Restlessness (34.4%), anorexia (28.4%), and vomiting (12.6%) were significantly more frequent in 4-month-olds, while pain was significantly more common in 6-month-old children, as indicated in Table 3.

Table 3. The distribution of complications following vaccination with the pentavalent vaccine in the studied children based on age

Complications	2-month	4-month	6-month	P
Fever	76.3	62.8	64	0.006
Pain	40.6	34.4	56.5	0.000
Convulsion	1.4	2.7	1.1	0.44
Restlessness	19.8	34.4	20.4	0.001
Anorexia	2.9	28.4	17.7	0.001
Diarrhea	9.2	10.9	4.3	0.054
Vomiting	1.9	12.6	7.5	0.000
Intense Crying	8.7	3.8	4.3	0.07
Skin Redness	60.9	50.8	55.9	0.13
Stiffness	7.2	5.5	5.4	0.67
Abscess at injection site	1	1.1	1.1	0.99
Abnormality in consciousness	1	0.5	0	0.41

A higher number of term children showed fever, abscess at the injection site, reduced consciousness, stiffness, and pain. However, none of them reached a statistical significance threshold. Restlessness, anorexia, diarrhea, vomiting, and intense crying were significantly higher in preterm children, as represented in Table 4.

Table 4. The distribution of complications following vaccination with the pentavalent vaccine in the studied children based on gestational age

Complications	Pre-term (%)	Term (%)	P
Fever	31.6	72.1	0.000
Pain	33.3	44.9	0.06
Convulsion	0	1.9	0.35
Restlessness	71.9	19.5	0.000
Anorexia	26.3	14.6	0.02
Diarrhea	15.8	7.3	0.003
Vomiting	19.3	5.8	0.001
Intense Crying	22.8	3.9	0.000
Skin Redness	61.4	55.5	0.23
Stiffness	0	6.7	0.02
Abscess at injection site	0	1.2	0.53
Abnormality in consciousness	0	0.6	0.73

Children without underlying diseases experienced more side effects than children without underlying conditions. Being diagnosed with an underlying disease was significantly related with

convulsion, diarrhea, vomiting, and skin redness. Pain was insignificantly higher in children with an underlying condition. Other items are indicated in the table (see Table 5).

Table 5. The distribution of complications following vaccination with the pentavalent vaccine in the studied children based on the presence or absence of an underlying disease

Complications	With an underlying disease (%)	Without an underlying disease (%)	P
Fever	68.6	75	0.25
Pain	43.9	40.6	0.43
Convulsion	1.1	12.5	0.001
Restlessness	24.6	25	0.55
Anorexia	15.4	21.9	0.22
Diarrhea	5.9	46.9	0.000
Vomiting	5.1	40.6	0.000
Intense Crying	6.1	0	0.14
Skin Redness	57.5	31.3	0.003
Stiffness	6.4	0	0.12
Abscess at injection site	0.9	3.1	0.29
Abnormality in consciousness	0.6	0	0.84

Regarding contraindications for infusing the pentavalent vaccine, convulsion (1.7%), fever above 41 °C (1.7%), crying for more than 72 hours

(0.9%), and reduced consciousness (0.5%) were reported, while shock was seen in none of children (see Table 6).

Table 6. The frequencies of the pentavalent vaccine's contraindications

Contraindications	Frequency	Percentage
Convulsion	10	1.7
Crying over 72 hours	5	0.9
Shock	0	0
Fever >41 °C	10	1.7
Reduced consciousness	3	0.5

4. Discussion

Infectious diseases are a major part of health problems all over the world, and today despite effective vaccines, infectious diseases still cause many problems for human health. Vaccination is considered as a type of first-level prevention that protects both the vaccinated person and the society. Its program is one of the most successful health interventions in medical programs [16-18]. Infants and children are threatened by various diseases, which is the reason for a widespread vaccination [19, 20].

In the conducted studies, Pentavalent vaccine side effects have been reported. Therefore, in the study of Hatami *et al.*, in the group of children aged 2 to 6 months, it was shown that out of 676 children aged 2 to 6 months examined, the most complications related to Pentavalent vaccine were related to fever with a rate of 71.2%, pain with a rate of 52.5%, and restlessness. With the rate of 17.8% [21]. Likewise, in the study of Khazaei *et al.* on the 2–6 months infants, it was shown that in people receiving Pentavalent vaccine, fever with a rate of 1997 (11.37%), High fever was reported by 4944 (28.15%), diarrhea and vomiting by 277 (1.58%), seizures due to fever by 287 (1.63%). In addition, 420 (2.39%) of the vaccinated people were hospitalized and 17,141 (61.97%) were not hospitalized [7]. The results of the studies are consistent with the results of the proposed study.

It is suggested to conduct more studies with larger sample sizes in other health centers of the country to confirm our

findings. Considering that fever was the most common complication, pre-test/post-test studies with larger sample sizes are required to assess the true prevalence of this complication after vaccination with the pentavalent vaccine.

5. Conclusion

Overall, the results of this study revealed that fever, skin redness, and pain were the most common complications. Fever was more common in 2-month-old boys, and pain was more frequently observed in 6-month-old girls. In most cases, the reported side effects were transient and disappeared a week after vaccination. Since there were no serious contraindications, the vaccine seemed to be safe for being infused to children.

Authors' contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

Conflict of interest

There are no conflicts of interest in this study.

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