Original Article
The effect of community comprehensive nursing using scenario-based health education on the infant and young child immunization rates

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Abstract: Objective: To investigate the effect of community comprehensive nursing using scenario-based health education on the infant and young child immunization rates. Methods: Ninety-eight infants and young children who were given immunizations in our hospital were divided into two groups, with 49 participants in each group. The control group was administered routine nursing, and the research group underwent community comprehensive nursing using scenario-based health education. The vaccination rates, the mastery of vaccination knowledge before and after the nursing, the adverse effects, the compliance, the satisfaction with the nursing, and the incidence of medical disputes were recorded and analyzed. Results: The delayed vaccination rate was significantly lower in the research group than it was in the control group, and the timely vaccination rate in the research group was significantly higher than it was in the control group (P<0.05). There was no statistically significant difference in the incidences of medical disputes between the two groups (P>0.05). The basic and total vaccination awareness rates were significantly higher in the research group compared with the control group (P<0.05). The incidence of adverse effects in the research group was significantly lower than it was in the control group (P<0.05). The full and total compliance rates in the research group were both significantly higher than they were in the control group (P<0.05). The proportions of very satisfied and completely satisfied were both significantly higher in the research group compared to the control group (P<0.05). Conclusion: In the infant and young child immunization program, community comprehensive nursing using scenario-based health education can effectively increase the vaccination rate, increase the parents’ knowledge, enhance their compliance, reduce the adverse effects, and improve the satisfaction with the nursing.

Keywords: Infant and young childhood immunizations, scenario-based health education, community comprehensive care, vaccination rates

Introduction

An infant and young child immunization program is a project designed around the emergence of infectious diseases and the immune characteristics of infants and young children. Through the targeted inoculation of biological products in the body, the specific acquired immunity of the susceptible population will be established, a key strategy for eliminating and preventing the corresponding infectious diseases [1]. Since the implementation of childhood immunization in our country in the 20th century, the incidences of measles, neonatal tetanus, epidemic hepatitis B, meningitis, tuberculosis, and other vaccine-preventable infectious diseases has continued to hit record lows [2]. According to data from the Chinese Center for Disease Control and Prevention in 2013, except for Tibet, the inoculation rates of the five recommended vaccines for children in townships and counties have reached more than 95% [3]. However, with the rapid economic development in recent years, the frequent migration of certain populations has brought new challenges to the implementation of the infant and young childhood immunization program. The vaccination rate has begun to decline, leading to an increased incidence of vaccine-preventable diseases each year, especially chickenpox and measles that occur occasionally in local outbreaks [4]. Therefore, determining how to increase the effective vaccination rate of infants and young children has
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become a major concern of the immunization program in our country.

Health education plays a pivotal role in promoting the implementation of the immunization program. Because many parents lack the knowledge of childhood disease prevention and health care, they are not very conscious of vaccination and cannot correctly understand the non-adverse local effects that may occur after vaccination in infants and young children, effects that lead to frequent medical disputes. Additionally, parents will hesitate about or even resist vaccination to a certain extent [5]. Proper health education can enhance parents' awareness and vaccination-related knowledge, improve their cooperation, and better promote vaccination [6]. Scenario-based health education is mainly defined as creating a specific and vivid environment, in which parents are immersed in a situation related to the content of classroom teaching at the beginning of the training so that they can acquire vaccination knowledge better and more quickly [7]. This study aimed to improve parents' awareness and recognition of the infant and young child immunization program through community comprehensive nursing using scenario-based health education, which can reduce the adverse effects of vaccination among infants and young children.

Materials and methods

General information

Ninety-eight infants and young children and their parents who underwent an immunization program in our hospital from August 2019 to July 2020 were recruited as our research cohort. According to the random number table method, the participants were divided into a control group and a research group, with 49 participants in each group. The control group was administered routine nursing, while the research group was administered community comprehensive nursing using scenario-based health education. This study was approved by the ethics committee of our hospital.

Selection criteria

Inclusion criteria: Infants and young children who were 0-3 years old, the guardians were the parents of the infants and young children, were non-illiterate, and could identify common Chinese characters in daily life, the guardians had normal cognitive abilities, vision, and hearing, and could communicate with the medical staff normally, the guardians lived with the infants and young children and took care of them in daily life, the guardians signed the informed consent forms for this study. Exclusion criteria: Participants who were transferred to other areas for vaccination, guardians who could not implement vaccinations at a given time in this study, children with congenital humoral immunodeficiencies, insufficient innate immunity, congenital heart disease, or other diseases.

Methods

The control group was administered routine nursing [8]. The parents were informed of the vaccination times by phone and messages and went to the immunization center at a specific time. Before the vaccinations, the parents were instructed and educated by volunteers to hold their children in a suitable manner and to attract the children's attention during the inoculation. The parents were also informed of the possible adverse effects on the infants and young children after the vaccination, and were recommended to feed the children high-protein and nutritious foods, such as breast milk, milk, fish, soybeans, meat, eggs, etc., and essential amino acid supplements to improve their immunity. Of note, the diet should be plain and non-greasy. Breastfeeding mothers need to ensure their own nutrition for high-quality breastfeeding.

The research group was administered comprehensive community nursing using scenario-based health education [9]. 1) Each family member was given a health manual, which describes diseases that can be prevented by vaccines, the required ID for vaccinations, the types of vaccines for infants and young children before 1-year-old, the adverse effects after vaccination, and so forth. Multimedia health education was established to recruit parents in the community, show them the entire process of immunization using pictures, PowerPoint, video, and other approaches, and introduce the types of vaccines and preventable infectious diseases and possible adverse effects after vaccination. Examples of infectious disease outbreaks in schools were cited to make the
parents aware of the necessity of immunization. The videos and pictures were designed to be easy to understand, true, and intuitive. 2) Hands-on rehearsal, a vaccination environment, was constructed for the parents on-site. The parents and the children were invited to practice the vaccination process, in which the nurses gave praise and rewards based on children's performance, eliminated the children's fear during vaccination, and at the same time ameliorated the parents' excessive worry, and interacted with the parents to answer their vaccination questions. 3) Seven days before the vaccination, the children were checked for symptoms such as runny nose and cough. If these symptoms were found, the inoculations had to be postponed. The children were held upright during the vaccination, drank more water after their vaccination, and were checked for body temperature every day at 7:00 and 17:00 with a personal mercury thermometer. If a fever or any abnormal effects were indicated, the children were immediately sent to see a doctor. A cold compress was applied to the injection site within 48 hours of the inoculation, and the skin color was checked during the cold compress application, 10-30 min/time, 3 times/day. Three days before and after the vaccination, high-fiber and greasy food was not recommended to avoid gastrointestinal discomfort. If diarrhea occurred within half a month before the vaccination, the vaccination had to be suspended.

**Outcome measurements**

**Primary measurements:** (1) Vaccination rate: the calculation was based on the time when parents came to apply for the vaccination certificate in our hospital, and the delayed vaccination rate and timely vaccination rate of the two groups of infants and young children were recorded. Delayed vaccination rate = (number of delayed vaccination cases/total number of cases) * 100%. Timely immunization rate = (number of timely vaccination cases/total number of cases) * 100%.

(2) Mastery of vaccination knowledge: the patients' vaccination knowledge was recorded and analyzed, including ID for vaccination, vaccine-preventable diseases, the times for handing out the vaccination certificates, the validity period of the vaccination certificates, the adverse effects after vaccination, the vaccination contraindications, the vaccination intervals, and so on. If the parents can easily answer the questions without any hint or could answer them after being given a hint (less than 10%), it was considered basic awareness. If the parents needed hints (10%-40%) to answer some of the questions, it was considered partial awareness. If the parents can barely answer the questions after being given some hints (41%-60%), it was considered low awareness. If the parents answered the questions after being given 60% hints, or if they didn’t know the answer even if hints were provided, it was considered unknown. Effective awareness rate = ((basic awareness + partial awareness)/n) * 100%.

(3) Adverse effects: we recorded the adverse effects that occurred in the infants and young children after their vaccinations, including redness, swelling, and pain at the injection site, and fever, vomiting, and diarrhea.

**Secondary measurements:** (4) Compliance: the parents’ compliance was investigated during the study period, including a healthy diet, temperature measurement, prevention, and the treatment of complications, etc. The parents' compliance following the nurse's requirements that was over 90% was considered full compliance. The parents' compliance that was in line with nurse's requirements that reached 70%-90% was considered partial compliance. The parents' compliance with the nurse's reasonable requirements that was less than 70% was considered non-compliance. Total compliance rate = ((full compliance + partial compliance)/n) * 100%.

(5) The satisfaction with the nursing: the satisfaction with the vaccination and the nursing was explored using a homemade satisfaction questionnaire by our hospital, which included health propagation and education, scenario-based performance, nursing attitudes, communication skills, etc. The total possible scores ranged from 0 to 100 and included very satisfied (≥90), satisfied (80-89), fair (70-79), dissatisfied (60-69 points), and very dissatisfied (<60). Satisfaction = ((very satisfied + satisfied)/n) * 100%.

(6) Medical disputes: the rate of medical disputes resulting from the parents' insufficient knowledge of vaccinations was recorded and analyzed.
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**Table 1. Comparison of the two groups’ general information (X ± sd, %)**

<table>
<thead>
<tr>
<th>Group</th>
<th>Control group (n=49)</th>
<th>Research group (n=49)</th>
<th>t/χ²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>28</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>21</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>21.31±1.66</td>
<td>20.86±1.48</td>
<td>t=1.416</td>
<td>0.160</td>
</tr>
<tr>
<td>Infant and young childhood ages (months)</td>
<td>25.2±2.1</td>
<td>26.1±2.2</td>
<td>t=1.960</td>
<td>0.053</td>
</tr>
<tr>
<td>Guardian (years)</td>
<td>26.5±3.7</td>
<td>26.0±3.6</td>
<td>t=0.757</td>
<td>0.451</td>
</tr>
<tr>
<td>Guardian’s education level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle school and below</td>
<td>11</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school and or technical school</td>
<td>18</td>
<td>22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junior college and above</td>
<td>20</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guardian’s occupation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil servant/teacher</td>
<td>11</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical staff</td>
<td>3</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business/catering service</td>
<td>11</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worker/farmer</td>
<td>18</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed/others</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: BMI: body mass index.

**Table 2. Comparison of the vaccination and medical disputes between the two groups (n (%))**

<table>
<thead>
<tr>
<th>Group</th>
<th>Delayed vaccination rate</th>
<th>Timely vaccination rate</th>
<th>Incidence of medical disputes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (n=49)</td>
<td>18 (36.73)</td>
<td>31 (63.27)</td>
<td>1 (2.04)</td>
</tr>
<tr>
<td>Research group (n=49)</td>
<td>9 (18.37)</td>
<td>40 (81.63)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>χ²</td>
<td>12.100</td>
<td>8.345</td>
<td>1.010</td>
</tr>
<tr>
<td>P</td>
<td>0.001</td>
<td>0.004</td>
<td>0.315</td>
</tr>
</tbody>
</table>

Note: In the control group, 6 infants delayed vaccination due to potential cold indicators such as runny noses and cough, colds, or diarrhea. In the research group, 4 infants delayed vaccination due to the above reasons.

**Statistical analysis**

The statistical analysis was carried out using SPSS 23.0 software. The count data were expressed as a percentage and analyzed using χ² tests. The quantitative data were presented as the mean ± standard deviation (X ± sd). Independent sample t-tests were used for the comparisons between two groups, and paired t-test were used for the comparisons within a group before and after the nursing. P<0.05 indicated a statistically significant difference.

**Results**

**General information**

There were no statistically significant differences in terms of the baseline data such as gender, body mass index (BMI), and the ages of the infants and young children between the two groups (P>0.05), indicating that the two groups were comparable (Table 1).

**Vaccination and medical disputes**

The delayed vaccination rate in the research group was significantly lower than it was in the control group, and the timely vaccination rate of the research group was significantly higher when compared with the control group (P<0.05). There was no statistically significant difference regarding the incidence of medical disputes between the two groups (P>0.05). The data suggested that community comprehensive nursing using scenario-based health education helps improve the timely vaccination rates in infant and young child immunization programs (Table 2 and Figure 1).

**Mastery of vaccination knowledge**

The basic knowledge and total vaccination awareness rates in the research group were significantly higher than they were in the control group (P<0.05). These results indicated that community comprehensive nursing using scenario-based health education helps to enhance the parents’ knowledge of infant and young child immunization programs (Table 3).
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Adverse effects

The incidence of adverse effects was significantly lower in the research group compared with the control group (P<0.05), which indicated that community comprehensive nursing using scenario-based health education helps to reduce the adverse effects of infants and young children after their vaccinations (Table 4).

Compliance

The full compliance and total compliance rates in the research group were significantly higher than the corresponding rates in the control group (P<0.05), which indicated that community comprehensive nursing using scenario-based health education helps to improve parents’ compliance (Table 5).

Satisfaction with the nursing

The proportions of very satisfied and total satisfaction in the research group were significantly higher than they were in the control group (P<0.05), which suggested that the nursing service was more likely to be recognized by the parents in community comprehensive nursing using scenario-based health education programs (Table 6).

Discussion

The vaccination knowledge awareness rate is a pivotal approach to improving the quality of...
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Table 5. Comparison of the compliance between the two groups (n (%))

<table>
<thead>
<tr>
<th>Group</th>
<th>Full compliance</th>
<th>Partial compliance</th>
<th>Non-compliance</th>
<th>Total compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (n=49)</td>
<td>31 (63.27)</td>
<td>10 (20.41)</td>
<td>8 (16.33)</td>
<td>41 (83.67)</td>
</tr>
<tr>
<td>Research group (n=49)</td>
<td>41 (83.6)</td>
<td>6 (12.24)</td>
<td>2 (4.08)</td>
<td>47 (95.92)</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>5.235</td>
<td></td>
<td></td>
<td>4.009</td>
</tr>
<tr>
<td>P</td>
<td>0.022</td>
<td></td>
<td></td>
<td>0.045</td>
</tr>
</tbody>
</table>

Table 6. Comparison of the satisfaction with the nursing between the two groups (n (%))

<table>
<thead>
<tr>
<th>Group</th>
<th>Very satisfied</th>
<th>Satisfied</th>
<th>Fair</th>
<th>Dissatisfied</th>
<th>Very dissatisfied</th>
<th>Total satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group (n=49)</td>
<td>26 (53.06)</td>
<td>13 (26.53)</td>
<td>7 (14.29)</td>
<td>2 (4.08)</td>
<td>1 (2.04)</td>
<td>39 (79.59)</td>
</tr>
<tr>
<td>Research group (n=49)</td>
<td>40 (81.63)</td>
<td>6 (12.24)</td>
<td>2 (4.08)</td>
<td>1 (2.04)</td>
<td>0 (0.00)</td>
<td>46 (93.88)</td>
</tr>
<tr>
<td>$\chi^2$</td>
<td>6.880</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4.346</td>
</tr>
<tr>
<td>P</td>
<td>0.009</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.037</td>
</tr>
</tbody>
</table>

vaccination, evaluating the effect of the propagation, and promoting the development of the immunization program [10]. Most parents do not know a lot about vaccination, so the awareness rate for vaccine-preventable diseases and the knowledge of vaccine classifications are low. Most of the questions related to vaccinations include ones like “Can I take a shower after vaccination?” and “What food should I avoid after vaccination?”, and so forth [11]. The Internet is a major way for most parents to understand vaccination, most of whom, however, are in a passive attitude and are only limited to completing the vaccination, which does not help parents accomplish the vaccination promptly [12]. This may also be due to the occupational and educational levels of the infants and young children’s parents. Parents with high educational backgrounds have stronger health awareness and abilities and more ways to obtain relevant information, and, therefore, are more likely to accept and understand new knowledge and are better aware of vaccination-related knowledge [13].

Studies have found that parental awareness and decisions are positively correlated with the immunization rates of infants and young children. Smith et al. found that parental vaccination attitudes and knowledge levels are independent factors that impact children’s vaccination rates [14]. Wallace et al. demonstrated that the parents’ knowledge of vaccination has a positive effect on improving their children’s enthusiasm for vaccination [15]. In China, researchers have reported that effective health education for parents can help improve the timely immunization rates in infants and young children [16]. The results of this study show that timely vaccination rates and vaccination knowledge mastery rate were significantly higher in the research group compared with the control group, and the compliance rate in the research group was also significantly higher than it was in the control group, suggesting that community comprehensive nursing using scenario-based health education can help improve the parents’ vaccination knowledge mastery, help them follow the doctors’ suggestions, and increase their awareness of vaccination and the importance of timely vaccinations. Wei reported that the implementation of scenario-based health education for children’s parents can effectively enhance the awareness rate of vaccination knowledge, the rate of scheduled immunizations for children, and the parental satisfaction rate, thereby more effectively controlling the prevalence and occurrence of infectious diseases, which is also consistent with the data in our study [17]. The practice has proved that the use of “introduction to inoculation scenario” for health education is more conducive to stimulating the parents’ learning, thinking, and interest, completing the goal of vaccination education, and enabling the parents to master vaccination-related knowledge faster and more comprehensively [18, 19]. Compared with traditional nursing, the scenario-based strategy is more interesting, interactive, and intuitive, so it is easier to earn the trust of parents and reduce the fear and tension of the infants and young children. In the performance of scenario simulation, the children and parents transfer boring
vaccination knowledge into interesting information through vivid performances, which also conforms to the psychological characteristics of children [20]. At the same time, it helps to discover existing problems during the performance, so they can make the corresponding adjustments accordingly to the teaching content to improve the efficiency. Therefore, interesting interactions unconsciously promote the relationship between parents and the nursing staff, wins the trust of the parents, and helps improve the parents’ compliance with and enthusiasm for inoculation [21].

It is worth noting that any vaccine may have certain adverse effects after immunization. This is because the vaccine is made through attenuated and killed pathogens such as viruses and bacteria, which still have a certain degree of toxicity, causing some normal adverse effects such as redness, swelling, and fever at the injection site [22, 23]. However, most parents do not understand this and think that the immunization is completed immediately, so the follow-up prevention is not given enough attention, which greatly increases the risk of adverse effects after vaccination among infants and young children, and even leads to medical disputes with the hospital [24]. Our results demonstrate that the incidence of adverse effects was significantly lower in the research group than it was in the control group, indicating that comprehensive community nursing using scenario-based health education can effectively reduce the risk of adverse effects caused by immunizations. Drinking more water and monitoring body temperature after vaccinations can effectively prevent abnormal symptoms like fever. Cold compresses can prevent redness, swelling, and pain at the injection site, and food management can avoid gastrointestinal discomfort.

Through the detailed management, the incidence of adverse effects can be controlled, and medical accidents can be avoided to a certain extent [25]. In addition, we conducted a survey of the nursing satisfaction and found that the satisfaction with the nursing in the research group was significantly higher than it was in the control group, revealing that nursing is can be recognized by parents through real and interesting community comprehensive nursing using scenario-based health education.

However, since there are few studies on the application of this approach for infant and young child immunization programs as references in China, this study was limited by its small cohort. Additionally, the follow-up time after the vaccination was short. Therefore, our data need to be further validated by other research groups, and the study cohort needs to be expanded, which warrants a prospective and multi-center study in the future.

In conclusion, in the infant and young childhood immunization program, community comprehensive nursing using scenario-based health education can effectively increase the vaccination rate, benefit the parents’ corresponding knowledge, enhance their compliance, reduce adverse effects, and improve the satisfaction with the nursing.

Disclosure of conflict of interest
None.

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