FACTOR AFFECTING HANDWASHING BEHAVIOR FOR PREVENTING ILLNESS ABSENCE AMONG CHILDREN OF KINDERGARTEN IN WEISHI COUNTY, CHINA

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摘要

题目:中国尉氏县幼儿园儿童预防因病缺勤洗手行为的影响因素

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本横断面描述性研究旨在调查河南省开封市尉氏县幼儿园儿童病缺勤的发生率、洗手行为，并探讨与洗手行为相关的因素，以预防因病缺勤。研究对象来自当地幼儿园。研究工具包括个人因素、家庭背景、洗手行为和病缺勤记录。数据采用频数、百分比、均值和标准差进行分析。

结果显示，过去一个学期儿童病缺勤的发生率最高，主要原因是感冒（65.27%）、腹泻（65.01%）和咳嗽（64.75%）；儿童洗手行为总体水平中等（均值 2.22±0.67），仅“户外活动后洗手”表现良好（均值 2.38±0.64），七步洗手法的遵守情况和洗手时长不足；学校类型显著影响洗手行为（χ^2 =14.45，p=0.001），仁德幼儿园儿童的依从性最高（45.20%），家庭因素与洗手行为无显著关联。发热显著影响洗手行为（χ^2 =6.32，p=0.01）。本研究为制定有针对

性的卫生政策提供了实证依据，凸显了学校在培养儿童健康习惯方面的核心作用。

关键词: 因病缺勤，洗手，行为，幼儿园儿童

ABSTRACT

Title: Factor Affecting Handwashing Behavior for Preventing Illness Absence among Children of Kindergarten in Weishi County, China

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This cross- sectional descriptive study aimed to investigate the prevalence of illness- related absence, assess handwashing behavior, and identify factors associated with handwashing practices for preventing illness absence among kindergarten children in Weishi County, Kaifeng City, Henan Province, China. Research participants were selected from local kindergartens. Research instruments included an assessment form of personal factors, family background, handwashing behavior, and illness absence records. Data were analyzed using frequency, percentage, mean, and standard deviation.

The results showed that the prevalence of illness absence in the past semester, mainly due to cold (65.27%), diarrhea (65.01%) and cough (64.75%); the overall level of hand washing behavior was at the moderate level (mean 2.22±0.67), only "washing hands after outdoor activities" performed well (mean 2.38±0.64), and the compliance

with the seven-step hand washing method and hand washing duration was insufficient. The school significantly affected hand washing behavior (χ^2=14.45, p=0.001), and the compliance of children in Rende Kindergarten was at the highest level (45.20%), while family factors had no significant association. Fever significantly affected hand washing behavior ($\chi^2 = 6.32$, $p = 0.01$). This study provides empirical evidence for the formulation of targeted health policies and highlights the core role of schools in cultivating children's healthy habits.

Keywords: Illness Absence, Hand-washing, Behavior, Kindergarten Children.

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CHAPTER I

INTRODUCTION

Background and rationale

Illness-related absence is an important problem among preschool and school children for low-, middle- and high-income countries. Appropriate hand hygiene is one commonly investigated and implemented strategy to reduce the spread of illness and the number of days spent absent (Munn Zachary et al.,2020). Hand washing is part of our life. Hands are the main cause of disease transmission. They spread vector infection from one person to another. Hand washing with soap (HWWS) is a simple and effective measure to prevent transmission of fecal-oral disease and other infectious diseases in school-age children. There are over 10 million episodes of food-related infection in a year but most of these are probably related to improper hand washing. Many of these deaths are easily preventable through simple practices such as hand washing with soap. Evidence suggests that improved hand washing can have a major impact on public health in any country and significantly reduce the two leading causes of childhood mortality (Kaur Parminder et al.,2019). Absence due to illness (particularly gastrointestinal or minor respiratory illness) is an important problem for schools in low-, middle- and high-income countries. The common cold alone has been shown to result in approximately 22 million days absent from school per year in the USA, and young children are likely to have between six and eight colds per year, decreasing to between two and four colds per year in adults. Not only are children adversely affected by repeated respiratory infections, family members can also be affected due to infections transmitted by an infected child. When a child is ill, this can result

in work-related absence due to parental illness or due to the need to remain at home to care for the child (Munn Zachary et al.,2020).

Handwashing is a fundamental and effective public health measure for preventing the transmission of infectious diseases. Improper or inconsistent hand hygiene significantly increases the risk of various infections, particularly in young children with developing immune systems. These children often live in close-knit environments like schools, where they frequently interact with others, sharing objects and spreading pathogens. Poor hand hygiene is strongly linked to the spread of respiratory infections, enteric diseases, and skin infections. For instance, One study found that a single hand hygiene event (i.e. washing hands with soap and water or using an alcohol-based hand sanitizer) reduced the risk of daily infection by just over 3% (Mo et al., 2022) as well as gastrointestinal diseases, such as diarrhea and parasitic infections (Mahmud et al., 2020; Khan et al., 2021). Additionally, proper hand hygiene helps prevent skin infections like scabies and tinea, which are common among children in unsanitary conditions (Amare et al., 2021; Armitage et al., 2023).

In addition to its health benefits, hand hygiene plays a crucial role in preventing illness- related absenteeism, which negatively impacts children's educationand development. Illnesses can easily spread among children, affecting not only their school attendance but also their academic performance and social growth. Frequent absences due to illness can delay learning progress and harm educational achievement (Munn et al., 2020). Proper handwashing, particularly after coughing, sneezing, using the toilet, or touching contaminated objects, is essential for preventing these infectious diseases. Promoting good hygiene habits in kindergartens, where children are highly susceptible to infections, is critical for reducing illness rates and supporting their overall development and

learning. As such, improving handwashing behaviors is an important step in reducing disease transmission, ensuring children's health, and enhancing their educational experiences. Handwashing is widely recognized as a primary preventive measure against infectious diseases, especially in group settings such as kindergartens where children are in close contact with one another. However, the practice of handwashing among young children is often inconsistent and influenced by various factors, including personal characteristics, family background, and school environment. Some studies have concluded that factors that influence preschool children's hand washing behavior include parental support, parental knowledge level, working mothers' behavior, and parenting style (Pinantika, 2022). Weishi County has seen concerns regarding absenteeism due to illness in kindergartens, but comprehensive data on its prevalence and related hygiene behaviors are still limited. Although anecdotal reports and limited school-level records suggest that illness-related absenteeism is a recurring issue, there is currently a lack of comprehensive and systematic data to accurately assess its magnitude, causes, and contributing factors. Kindergarten children represent a particularly vulnerable population due to their developing immune systems, close-contact learning environments, and often limited personal hygiene awareness. These factors can contribute to the rapid transmission of infectious diseases, resulting in increased absenteeism that affects not only children's health and development but also parental productivity and the functioning of early childhood education systems. Understanding these issues is essential to designing effective health promotion programs tailored to this vulnerable age group.

Based on the aforementioned context, the researcher is interested in conducting this study. This study aims to investigate the prevalence of illness-related absences and evaluate handwashing behavior among kindergarten students, as well as to identify the

factors associated with handwashing behavior in preventing illness-related absences among kindergarten students in Weishi County. The findings from this research are expected to serve as a foundational reference for the development of school health promotion strategies, particularly those that enhance hand hygiene practices among young children. Such efforts will help lay a strong foundation for lifelong health awareness and disease prevention.

Objective

1. To study the prevalence of illness absence among children of kindergarten in Weishi County.

2. To assess the handwashing behavior among children of kindergarten in Weishi County.

3. To identify the factor associated of handwashing behavior for preventing illness absence among children of kindergarten in Weishi County.

Research question

1. What is the prevalence of absences due to illness among kindergarten children in Weishi County?

2. What is the hand-washing behavior of kindergarten children in Weishi County?

3. What are the factors that affect the hand-washing behavior of kindergarten children in Weishi County to prevent absences due to illness?

Hypothesis

1. There is a significant prevalence of illness-related absence among kindergarten children in Weishi County.

2. The level of handwashing behavior among kindergarten children in Weishi County is at a moderate level or higher.

3. Personal factors and family factors are significantly associated with handwashing behavior for preventing illness absence among children of kindergarten in Weishi County.

Operational definition

Illness absence refers to the situation where a person is unable to attend work, school, or other activities due to health problems. When a person is ill, it means that they are unable to fulfill their original work, study, or other social responsibilities due to health problems. This may be due to physical discomfort, doctor's advice to rest, infectious diseases, or other health conditions. Illness absence usually requires a medical certificate or other relevant documents to prove that the absence is due to health problems.

Hand hygiene refers to the seven-step hand-washing method. Through correct hand washing and the use of hand disinfectants, pathogens on the surface of the hands can be effectively removed or killed, thereby reducing the spread of diseases in personal, healthcare, food safety and community environments. Proper hand washing involves using water and soap to thoroughly clean both hands, especially the palms, backs of hands, between fingers and nails, while hand disinfection uses alcohol disinfectants to

quickly kill most bacteria and viruses, especially when water and soap are not available or when additional protection is needed..

Handwashing refers to the process of thoroughly cleaning your hands with water and soap or other detergents to remove dirt, bacteria, and viruses. The purpose of this process is to keep your hands clean and reduce the spread of disease among individuals and communities. The correct way to wash your hands includes wetting your hands, applying an appropriate amount of soap, rubbing your hands for at least 15 seconds, including the palms, backs of hands, between fingers, nails, and wrists, and then rinsing them thoroughly with clean water. Handwashing is a basic practice of public health and personal hygiene, especially after contact with food, using the toilet, handling garbage or contact with patients, which can effectively prevent the spread of diseases.

Among kindergarten children refers to a specific group of children who are in kindergarten, typically ranging from about 3 to 6 years old, depending on the educational in Weishi County.

Family factors refer to the family's hand-washing habits, sanitary environment, education methods, attention and supervision. When parents and other family members develop correct hand-washing habits, children usually imitate their behavior; the cleanliness of the family's sanitary environment directly affects children's hand-washing behavior; family education methods help them form correct concepts by explaining the knowledge of hand-washing disease prevention and emphasizing the importance of health. Finally, family attention and supervision can increase children's attention to hand-washing behavior and encourage them to consciously develop the habit.

Hand washing behavior refers to following the correct process (wetting water, applying soap, rubbing various parts of the hands, rinsing and drying), actively performing it in key situations (such as before meals and after defecation), having the consciousness to do it without being reminded or completing it after being prompted, ensuring the correctness of the scrubbing time and the area covered, maintaining the long-term stability of the habit, and being able to follow it consistently in different environments (home, kindergarten, etc.).

Expected Benefits and Applications

Individual level

1. Through this survey, children can have a basic understanding of the frequency and time of self-washing hands, actively realize the disadvantages of not washing hands, reduce the situation of not washing hands from the root, and avoid the health problems caused by not washing hands.

2. It is conducive to children to enhance their health awareness of hand hygiene and reduce absence due to illness caused by not maintaining hand hygiene.

3. Improve children's hand-washing status and physical health.

School level

1. Understand the frequency and time of children's self-washing hands, as well as their hand-washing habits.

2. Carry out relevant health education and publicity activities on hand hygiene in a targeted manner, and have a more comprehensive understanding and attention to children's absence rate due to illness and hand hygiene status.

3. Remind children to develop the habit of washing hands frequently, timely discover and solve health problems caused by hand hygiene, and ensure the healthy growth of children.

Social level

1. All sectors of society should pay more attention to the hand hygiene of children and raise the public's awareness of children's health.

2. Popularize the correct knowledge and methods of hand washing to the public and inform the public to wash hands frequently, maintain good hand hygiene, and ensure the healthy growth of children.

CHAPTER II

LITERATURE REVIEW

This chapter summarizes the following aspects and explains the overall conceptual framework of the study. The following are the specific studies that support this study:

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Illness absence

Theory of illness absence

Absence due to illness (particularly gastrointestinal or minor respiratory illness) is an important problem for schools in low-, middle- and high-income countries. The common cold alone has been shown to result in approximately 22 million days absent from school per year in the USA, and young children are likely to have between six and eight colds per year, decreasing to between two and four colds per year in adults. Not only are children adversely affected by repeated respiratory infections, family members can also be affected due to infections transmitted by an infected child. When a child is ill, this can result in work-related absence due to parental illness or due to the need to remain at home to care for their child (Munn Zachary et al.,2020).

In modern society, illness has become one of the main problems affecting people's physical and mental health. Illness can cause people to be unable to go to work or school due to physical discomfort or the need for treatment, which results in absence. Absence due to illness has a negative impact on the health of occupational groups, workplace productivity, and social development. It is also a predictor of future morbidity, disability, and death, and has become an important indicator for determining employee health and labor productivity. Absenteeism rate due to illness (%) = number of absentees due to illness/number of people who should be present × 100% (Lu lu et al., 2022).

When a person is absent from work due to illness, it means that they are unable to fulfill their original work, school, or other social responsibilities due to a health problem. This may be due to a medical condition, a doctor's recommendation to rest, an infectious disease, or other health conditions. Illness absences usually require a medical certificate or other relevant documentation to prove that the absence is due to a health problem. In some work or school environments, there may be specific policies to deal with illness absences, such as requiring a medical certificate, compensatory work time, or arranging make-up lessons.

Definition of illness absence

Illness absence occurs when you are unable to attend work, school, or other activities due to a health problem.

Illness-related absence is an important problem among preschool and school children in low-, middle- and high-income countries. Appropriate hand hygiene is one commonly investigated and implemented strategy to reduce the spread of illness and subsequently, the number of days spent absent (Munn Zachary et al.,2020).

Causes of illness absence

There are many reasons for absence due to illness, including acute illnesses such as colds, fever, diarrhea, etc., chronic diseases such as asthma, diabetes, heart disease, etc., as well as surgery or treatment, infectious diseases, worsening health problems, doctors' advice to rest, and mental health problems. These health problems may make it impossible for individuals to fulfill their work or study responsibilities, so they need to be absent temporarily. Absenteeism from schooling is costly to parents, schools and governments and sustained absence is detrimental to student learning. Illness-related absenteeism is a significant contributor to Absenteeism from school, but can also result in parents missing work due to catching the illness themselves or having to stay home to care for their children (Munn Zachary et al.,2020).

Children's absence due to illness is a common problem in kindergarten management. The reasons include the child's physical condition, parental negligence and other factors. The child's physical condition directly affects whether he can go to school normally. Some chronic diseases and infectious diseases are susceptible to the period of illness. Parental negligence is also one of the reasons for children's absence due to illness, such as not vaccinating children and not paying attention to children's living habits.

Impact of illness absence

Absence due to illness may have a variety of effects on individuals, families, and work/learning environments, including impaired personal health, affected work/learning progress, reduced income, impaired team or class cooperation, increased psychological stress, and affected social relationships. Such absences may lead to increased personal financial burdens, decreased team cohesion, increased personal psychological stress, and

even affect personal social relationships. Therefore, it is crucial to maintain good health and prevent illness to reduce the negative impact of absence due to illness.

Children's absence due to illness may have a variety of effects, including impaired academic performance, hindered social development, impaired physical health, mental health problems, increased family burdens, and affected school performance. Frequent absences may affect children's learning progress, social skills, and mental health, while placing additional burdens on families.When children acquire an illness, this can spread through the family and result in days lost from school, and from work. Student school attendance is positively related to improved performance on standardized tests , whilst significant or chronic absence from schooling can have a detrimental effect on a student's academic achievement. Although lost days to an infectious illness like the common cold or gastroenteritis are not likely to result in a significant amount of attendance days lost from school, as compared to a chronic illness, there may still be an effect on learning and academic achievement (Munn Zachary et al.,2020).Therefore, preventing diseases, timely treatment and maintaining good physical health are essential to children's growth and development, helping to reduce the adverse effects of absence due to illness and ensuring that they can grow up healthily and happily.

Hand hygiene

Concept of hand hygiene

The concept of "hand hygiene" originated in hospitals. It is a general term for hand washing, sanitary hand disinfection and surgical hand disinfection. Its core skill is the "seven-step hand washing method" (Wang Jing, 2020). Hand hygiene is currently

recognized as one of the simplest, most effective, convenient and economical measures to prevent and control hospital infections. As one of the key measures of standard prevention, hand hygiene has played an important role in preventing and controlling hospital infections, controlling the spread of drug-resistant bacteria and hospital infection outbreaks. Through hand hygiene, the incidence of hospital infections can be effectively reduced and patient safety can be guaranteed. Depending on the level of infection risk that may be caused, different degrees of hand hygiene can be performed. The higher the degree of hand hygiene, the more effective it is in removing transient and resident bacteria from the hands. From daily hand washing for the general population to hand washing for medical staff in surgical or intensive care units, hand hygiene can be applied to most hygiene needs (Editorial Department of the Journal of Quanzhou Orthopedic Hospital, 2023).

Hand hygiene includes hand washing by medical staff, sanitary hand disinfection and surgical hand disinfection. Hand washing refers to the process in which medical staff wash their hands with soap (soap liquid) and running water to remove dirt, debris and some pathogenic bacteria from the skin of their hands. Sanitary hand disinfection refers to the process in which medical staff rub their hands with quick-drying hand disinfectant to reduce temporary bacteria on their hands. Surgical hand disinfection refers to the process in which medical staff wash their hands with soap (soap liquid) and running water before surgical operations, and then use hand disinfectant to remove or kill temporary bacteria on their hands and reduce permanent bacteria (Editorial Department of the Journal of Quanzhou Orthopedic Hospital, 2023).

In 1961, the United States began to pay attention to hand hygiene, requiring medical staff to wash their hands with soap before and after contact with patients, and took the lead in formulating and issuing relevant guidelines worldwide (Li Chengping, 2020).

Table 1 The development of hand hygiene around the world (Li, 2020)

Time	Publishing Agency	Guideline Name
1985	CDC	Guidelines for Hand Washing and Hospital Environmental Control
1995	American Association for Infection Control and Epidemiology	Guidelines for Hand Washing and Disinfection in Medical Institutions
1997	USA	Hand Hygiene Guidelines
2002	CDC	Guidelines for Hand Hygiene in Healthcare Facilities
2004	WHO	Launch of the Global Hand Hygiene Campaign
2005	WHO	Guidelines for Hand Hygiene for Medical Staff in Healthcare Institutions (Advanced Manuscript)
2005	WHO	WHO Guidelines on Hand Hygiene in Health Care
2008	WHO	October 15th of each year is designated as International Handwashing Day
2009	Former Ministry of Health	"Hand Hygiene Standards for Medical Staff in Medical Institutions"
2009	WHO	May 5th of each year is designated as "Hand Hygiene Day"
2009	WHO	Hand Hygiene Technical Reference Manual
2015	Former Ministry of Health	Special Guidance Program on Hand Hygiene (2015-2018)

Benefits of hand hygiene

1. Prevent the spread of infectious diseases: Frequent hand washing can effectively remove germs, viruses and other microorganisms on the hands, thereby reducing the spread of infectious diseases and helping to protect the health of oneself and others.

2. Reduce the risk of food poisoning: Washing hands can reduce the possibility of bringing bacteria and viruses into food, thereby reducing the risk of food poisoning.

3. Protect personal health: Good hand hygiene habits can help reduce the chances of contracting respiratory tract infections, gastrointestinal infections and other diseases, and protect personal health.

4. Reduce medical infections: In medical environments, correct hand hygiene is an important means to prevent hospital infections, which can reduce the risk of infection during surgery, treatment and contact with infectious patients.

5. Improve public health: By popularizing hand hygiene knowledge and cultivating good hand hygiene habits, the health conditions of the entire society can be improved, the spread of diseases can be reduced, and the level of public health can be improved.

6. Improve the quality of life: Good hand hygiene habits can make people live healthier and more comfortably, avoiding the inconvenience and pain caused by diseases.

In summary, maintaining good hand hygiene habits is very important for the health of individuals and society, which can prevent the spread of diseases, reduce medical risks and improve the quality of life.

Types of hand hygiene

1. Hand washing refers to the process in which medical staff wash their hands with soap or soap liquid and running water to remove dirt, debris and some pathogenic bacteria from the skin of their hands.

2. Hygienic hand disinfection refers to the process in which medical staff rub their hands with quick-drying hand disinfectant to reduce temporary bacteria on their hands.

Surgical hand disinfection refers to the process in which medical staff wash their hands with soap (liquid) or antibacterial soap (liquid) and running water before surgical operations, and then use hand disinfectant to remove or kill temporary bacteria and permanent bacteria on their hands (Editorial Department of the Journal of Quanzhou Orthopedic Hospital, 2023).

Moments of hand hygiene

The "Hand Hygiene Technical Reference Manual" published by WHO in 2009 proposed the concept of "Five Moments of Hand Hygiene". It introduces five moments of hand hygiene: before contact with patients, before aseptic operation, after exposure to body fluids, after contact with patients, and after contact with the patient's surroundings.

Figure 1 Schematic diagram of "5 moments of hand hygiene"(OpenWHO，2022)

The timing of hand hygiene outside the hospital depends on the specific situation and needs. In general, it is recommended to perform hand hygiene in the following situations:

1. When necessary: Hand hygiene should be performed in time when contact may contaminate the hands, such as after using the toilet, touching garbage, and before handling food.

2. At critical moments: Hand hygiene should be performed at certain critical moments, such as before and after eating, before and after treating wounds, and after contact with ill people or animals.

3. As needed: The time for hand hygiene should be flexibly selected according to actual conditions and needs. For example, hand hygiene can be performed when

traveling, attending gatherings or crowded occasions, or when hands feel unclean.

4. According to guidelines: Follow the recommended hand hygiene time according to the guidelines and recommendations of public health agencies or professional agencies. These guidelines usually provide detailed advice on when and how to perform hand hygiene.

In general, hand hygiene should be a conscious behavior, and timely and thorough cleaning should be performed according to specific circumstances and needs. Timely hand hygiene can effectively prevent the spread of diseases and protect the health of individuals and others.

Duration of hand hygiene

The duration of hand hygiene should be long enough to ensure that the hands are thoroughly cleaned. The generally recommended duration of hand hygiene is at least 15 seconds. During this time, soap and running water should be fully used to rub hands to ensure that bacteria, viruses and other microorganisms on the hands are thoroughly removed. If alcohol-based hand sanitizer is used, it is also necessary to rub the surface of both hands for at least 15 seconds until they are dry. By maintaining a sufficient duration of hand hygiene, the effectiveness of hand hygiene can be maximized to protect the health of individuals and others.

Hand washing

Concept of hand washing

Hand washing is a common personal hygiene habit, which refers to the process of washing hands with soap (liquid soap) and running water to remove dirt, debris and

some pathogens from the skin of hands. This process usually includes putting hands under water, applying soap and rubbing hands, ensuring that fingers, finger joints, back of hands and wrists are thoroughly cleaned, and finally rinsing with clean water and drying with a clean towel. The purpose of hand washing is to remove bacteria, viruses, dirt and other microorganisms on hands, thereby reducing the spread of infectious diseases and protecting the health of individuals and others. The correct way to wash hands includes continuous rubbing of hands and rinsing with running water for at least 15 seconds to ensure thorough cleaning. Hand washing is one of the important measures to prevent diseases and is considered one of the basic steps to stay healthy.

Benefits of hand washing

Practical hand hygiene helps reduce the spread of a range of diseases:

1. Washing hands with soap can reduce diarrheal diseases by 30%.

2. Washing hands with soap can reduce acute respiratory infections up to 20%.

3. Hand washing plays an important role in reducing the spread of outbreak-related pathogens such as cholera, Ebola, shigellosis, SARS, hepatitis E, and COVID-19.

4. Hand hygiene can prevent healthcare-associated infections and reduce the spread of antimicrobial resistance.

5. Hand hygiene may help reduce neglected tropical diseases (Changsha CDC, 2022).

Handwashing is a simple and effective hygiene habit, and its benefits are not limited to personal health, but also involve the public health of the whole society. First, handwashing can effectively reduce the spread of infectious diseases, especially during flu season or other high incidence periods of infectious diseases. By removing bacteria and viruses from your hands, you can greatly reduce the risk of infection and protect

the health of yourself and those around you. Secondly, good handwashing habits can help prevent food poisoning. During food preparation and consumption, bacteria and viruses can easily be transmitted to food through your hands, and thorough handwashing can effectively prevent this transmission and reduce the risk of food poisoning. In addition, handwashing is especially important for healthcare workers. In a medical setting, proper handwashing can prevent cross- infection, reduce the occurrence of hospital infections, and protect the health of patients and medical staff. Finally, handwashing is not only a personal responsibility, but also a social responsibility. By popularizing handwashing knowledge and cultivating good handwashing habits, we can work together to improve the hygiene of the whole society and safeguard public health and well-being.

Types of hand washing

The types of hand washing can be categorized based on a variety of factors such as the environment in which it is performed, the tools used, and the purpose. Here are some common types of hand washing:

1. Washing hands with water: The process of thoroughly cleaning hands with water and soap. This is the most basic and common way of hand hygiene, which effectively removes bacteria and viruses on the hands by rubbing hands and washing various parts of hands.

2. Alcohol hand washing: Using hand sanitizer containing alcohol ingredients, hand hygiene can be performed without water. Alcohol has a bactericidal effect. Using alcohol hand sanitizer can quickly kill bacteria and viruses on the hands. It is a common hand hygiene method in health care and specific environments.

3.

4. Disinfecting hand washing: Using disinfecting hand sanitizer containing disinfectants (such as ammonium chloride) when more thorough disinfection is required. Disinfecting hand washing can kill more germs and viruses and is suitable for some high-risk environments or special circumstances.

5. Dry hand washing: Use dry hand sanitizer or dry cleaning wipes containing cleaning ingredients to clean hands. This method is suitable for situations where water cannot be used to wash hands, but the effect is usually not as thorough as water hand washing.

Hand disinfection: Use a disinfectant or wipes containing disinfecting alcohol or other bactericides to disinfect hands locally or comprehensively. This method is usually used in healthcare environments or special circumstances to completely kill germs and viruses.

Different types of hand washing can be chosen according to specific needs and circumstances to keep hands clean and prevent the spread of disease.

Moments of hand washing

Correct hand washing definition:

1. Wash your hands every time before eating, after going to the toilet, after finishing work/after getting off work, after touching coins, after going to the hospital/after touching patients, etc.

2. Use running water to rinse your hands.

3. Use soap, perfumed soap, hand sanitizer, and other cleaning products when washing your hands.

4. Wash your hands for at least 20 seconds. Meeting the above 4 criteria at the same time is correct hand washing (Changsha CDC, 2022).

For children, the moment of hand washing is similar to that of adults, but more attention is needed because their immune system is not fully developed and they are more susceptible to bacteria and viruses. Here are some important moments for children to wash their hands:

1. After using the toilet: After using the toilet, especially after defecation, you should wash your hands immediately to prevent the spread of bacteria and viruses.

2. After returning home: After returning home from outside, especially after returning from school, kindergarten or outdoor activities, you should wash your hands immediately to clean off bacteria and dirt that may remain on your hands.

3. After contacting animals: After playing with pets or contacting other animals, you should wash your hands immediately to avoid the spread of bacteria and viruses.

4. After playing: After playing games or playing outdoors or indoors, especially after contact with dirt, sand or other contaminants, wash your hands immediately.

5. Before and after handling food: Wash your hands thoroughly before and after preparing food or eating to prevent bacteria and viruses from being introduced into food.

6. After coughing or sneezing: Wash your hands immediately after coughing, sneezing or blowing your nose to prevent the spread of viruses.

7. Other necessary moments: Wash your hands as needed in other situations where you may be exposed to bacteria, viruses or other contaminants.

For children, parents and teachers should regularly educate them to develop good hand-washing habits and supervise them to wash their hands at key moments to protect their health.

Duration of hand washing

For children, hand washing should also last at least 15 seconds. This is enough time for them to fully wash all parts of their hands, including the palms, backs of hands, between fingers, fingertips and wrists. You can help them keep washing their hands for a sufficient time by counting or singing with them. For example, you can sing a 15-second song or count to 15. Doing this will not only ensure that they develop a good habit of washing their hands fully, but also make the process of washing hands more interesting and enjoyable.

Equipment for hand washing

Kindergartens are usually equipped with a series of hand-washing equipment so that children can wash their hands when needed. This equipment includes but are not limited to the following:

1. Wash basin: Usually a row of low wash basins suitable for the height of children. The wash basin is usually equipped with a shower head or faucet for the convenience of children.

2. Soapbox: The soap box provided for children is usually fixed next to the wash basin for the convenience of children when washing their hands.

3. Soap liquid or soap pump: In order to facilitate the use of children, liquid soap or soap pump is generally used to avoid waste and pollution caused by the use of solid soap.

4. Towel or paper towel: Towel or paper towel is provided for children to dry their hands to keep their hands dry after washing.

5. Hand sanitizer or hand soap: Some kindergartens may provide hand sanitizer or hand soap, especially for children with sensitive skin.

6. Child safety steps: In order to make it easier for children to reach the wash basin, some safe steps may be set up so that children can easily stand next to the wash basin.

7. Child-friendly design: The design of hand washing equipment usually takes into account children's usage habits and safety, such as using colorful designs, cute cartoon patterns, etc., so that children are more willing to wash their hands.

The purpose of these devices is to promote good hand-washing habits among young children and ensure their health and safety.

Hand washing practice

You can use the seven-step hand-washing method to wash your hands to ensure that every part is fully cleaned.

The seven-step hand washing method can be simply remembered as: inside, outside, clamp, bow, big, stand, wrist. The steps are as follows:

First, wet your hands with running water and apply hand sanitizer or soap.

Step 1: Palms facing each other, fingers together, rub each other.

Step 2: Palms facing back of hands, rub each other along the fingers, and switch.

Step 3: Palms facing each other, cross your fingers, and rub each other.

Step 4: Bend your fingers so that the joints are placed on the other palm and rotate and rub, and switch.

Step 5: Hold the thumb of the other hand with one hand and rub it, and switch.

Step 6: Put the fingertips together and place them on the palm of the other hand and rotate rub, and switch.

Step 7: Hold the wrist of the other hand with one hand and rotate and rub, and switch.

Wash your hands carefully and rub your hands for at least 15 seconds. You should pay attention to cleaning all the skin of your hands, including the back of the fingers, fingertips, and fingertips. Finally, rinse your hands thoroughly under running water (Editorial Department of the Journal of Quanzhou Orthopedic Hospital, 2023).

Figure 2 Seven-step hand washing method (Editorial Department of the Journal of Quanzhou Orthopedic Hospital, 2023)

Handwashing Behavior

Definition and Concept of Behavior

Behavior refers to the manners, actions and performances displayed by a person or an organization at a specific time and in a specific environment. It is the basic form of human response to external stimuli and can be presented through words, actions, expressions, postures, etc. Behavior is divided into individual behavior (such as living habits), group behavior (such as teamwork) and social behavior (such as compliance with the law). It is influenced by factors such as genetic genes, personal experience, and social culture. It is a comprehensive reflection of internal psychology and external environment. Behavior is often generated under the balance between personal inner needs and external pressure (Baidu Wenku, n.d.).

Factors affecting handwashing behavior

1. Children's knowledge of handwashing behavior

Children's knowledge of the importance of handwashing directly affects their handwashing behavior. Research shows that knowing that handwashing can reduce the spread of disease is a key factor in motivating children to develop good handwashing habits. Educational interventions can improve children's knowledge of handwashing, such as through classroom teaching, picture books, and interactive games to enhance their understanding. The study demonstrates that school children achieved strong progress in handwashing knowledge and practice through education-based interventions, as evidenced by a randomized control trial (Al Nadwi et al., 2022).

2. Family background

The family environment has a significant impact on children's handwashing behavior. Parents' behavior patterns, family rules, and family members' health concepts can all affect children's handwashing habits. For example, parents' role modeling is very important. If parents wash their hands frequently in front of their children, children are more likely to imitate and develop good handwashing habits.

3. Social and cultural factors

Social and cultural backgrounds also affect children's handwashing behavior. In some cultures, handwashing may not be a common hygiene habit, or the way and frequency of handwashing may be different. Understanding local cultural habits and social norms can help design more effective interventions.

4. Environmental factors

Environmental factors such as the availability and convenience of handwashing facilities can also affect children's handwashing behavior. In schools and public places, providing sufficient hand washing facilities, properly arranging hand washing sinks, and ensuring the supply of hand sanitizer and paper towels are key factors in promoting hand washing among children.

Among kindergarten children

Definition

Children usually refer to people in the childhood stage, and their ages are usually between birth and adolescence (usually 18 years old). The Convention defines a "child" as a person below the age of 18 (United Nations Children's Fund [UNICEF],

n.d.). Toddlers usually refer to children in the kindergarten stage, and their ages are generally from birth to about 6 years old. Children at this stage are usually in the early stages of growth and development and need special attention and care. The characteristics of toddlers include curiosity and desire to explore the external environment, the development of language and cognitive abilities, and social and emotional growth. In early childhood education, the focus is usually on promoting the all-round development of children, cultivating good living habits and social skills, and establishing a good learning foundation. The children in this survey mainly refer to children aged 3 to 6.

Health risk factors for among kindergarten children

Studies have shown that infectious diseases are the main cause of morbidity and mortality in children. Hand infection is one of the main sources of common pathogens that cause respiratory and digestive tract infections in children. As a respiratory infectious disease, the new coronavirus pneumonia (hereinafter referred to as "new coronavirus pneumonia") can also be transmitted through contact. Keeping hands clean and washing hands regularly is one of the effective prevention strategies. Therefore, it is very meaningful to establish the awareness of frequent hand washing and form correct hand washing behavior to protect children from infection with the new coronavirus and other common childhood infectious diseases (Cao Yuan et al., 2022).

Health risk factors for young children include but are not limited to:

1. Transmission of infectious diseases: Collective living environments such as kindergartens or nurseries are prone to the spread of infectious diseases, such as influenza and hand, foot, and mouth disease. Failure to pay attention to hand hygiene

can easily cause the spread of infectious diseases, especially when children contact each other and share toys.

2. Fecal-oral transmission of diseases: During early childhood, because children's self-hygiene awareness has not yet been fully formed, they may spread bacteria with feces on their hands to their mouths, increasing the risk of fecal-oral transmission of diseases such as diarrhea and respiratory infections.

3. Bacterial and viral infections: The immune system is not fully developed during early childhood, and they are susceptible to various bacteria and viruses. Not washing hands or washing hands incompletely will increase the risk of exposure to bacteria and viruses, leading to respiratory infections, digestive tract infections and other diseases.

4. Personal hygiene habits: Early childhood is an important period for developing personal hygiene habits. Bad hygiene habits, such as not washing hands and not cutting nails, will increase the risk of skin infections, parasitic infections, etc.

5. Infectious diseases and insufficient vaccination: Because young children's immune systems are not fully developed, they are more susceptible to infectious diseases, especially when they come into contact with other young children or public places. At the same time, if young children are not vaccinated on time, they will also increase the risk of contracting diseases.

6. Malnutrition and poor eating habits: Early childhood is a critical stage of growth and development, and malnutrition can affect physical and intellectual development. Bad eating habits, such as excessive intake of high-sugar, high-salt, and high-fat foods, will also increase the risk of obesity and chronic diseases.

Young children may face various safety issues during their exploration and learning, such as accidental injuries, scalds, drowning, etc. In addition, unsafely stored medicines, detergents, and chemicals may also cause harm to young children.Studies have shown that among children under five years of age, most of the unintentional injuries happen at home. The main causes of death in this age group are choking, suffocation or strangulation (49%), drowning (22%), falls (8%), and smoke, fire and flames (8%) (Jullien, 2021).Topic of related research

Long Hongmei and Peng Xiaoxue (2024) published "Analysis of related influencing factors and prevention and control measures for children with infectious diarrhea". The purpose is to explore the related factors of children with infectious diarrhea and provide a certain basis for the clinical formulation of prevention and control strategies. The research subjects were children with infectious diarrhea admitted to Qingyuan District People's Hospital of Ji'an City from March 2020 to March 2023 (60 cases in the observation group) and healthy children who underwent physical examinations during the same period (65 cases in the control group). The results showed that there was no statistically significant difference in gender, age, household registration, place of residence, parents' education level, children's hand washing after defecation, and parents' hand washing after defecation between the two groups ($P>0.05$). The proportion of children in the observation group who did not wash their hands before meals, sucked their fingers, had unsterilized tableware, did not deal with leftovers in time, had poor fingernail hygiene, and had contact with diarrhea patients in the past week was higher than that in the control group, and the difference was statistically significant; logistic regression analysis showed that children who did not wash their hands before meals, had finger sucking behavior, unsterilized tableware, did

not deal with leftovers in time, had poor fingernail hygiene, and had contact with diarrhea patients in the past week were related risk factors for the onset of infectious diarrhea in children (P<0.05).

Wang Jing (2023) published "Survey on the Current Status of Hand Hygiene Knowledge and Practice of Middle School Students in 2020" to survey the current status of hand hygiene knowledge and practice of middle school students in Urumqi and provide a basis for related health education work. The research subjects were 400 middle school students in a middle school in Urumqi, and a self-made questionnaire was used to investigate the hand hygiene awareness rate, hand hygiene health education, and the impact of learning and life on hand hygiene. Results 370 valid questionnaires were collected, with a questionnaire recovery rate of 92.50%. 70.00% of students obtained hand hygiene knowledge from health classes, 57.84% of students obtained health knowledge from classmates, and 70.00% of middle school students wanted to know the purpose of hand hygiene. Students with a learning time of 10-12 hours not only had a higher level of hand hygiene knowledge (χ^2=11.416, P<0.010), but were also more likely to share the knowledge they acquired in interpersonal communication (χ^2=9.571, P<0.023) and were more likely to put it into action (χ^2=9.932, P<0.019). The utilization rate of hand hygiene facilities and items in schools is generally high. When middle school students are required to perform hand hygiene, the implementation rate is 95.68%, and the personal hand hygiene satisfaction is 97.03%.

Lu Lu et al., (2022) published "Analysis of the Monitoring of Students' Absence Due to Illness in Shunde District, Foshan City, 2015-2018 School Years". The purpose is to analyze the monitoring of students' absence due to illness in Shunde

District in 2015-2018 school years to provide a basis for the prevention and control of school infectious diseases. The research subjects collected data on students' absence due to illness in Shunde District from the "Foshan Student Health Monitoring Information System" from 2015 to 2018 school years. The results showed that a total of 837,076 cases of absence due to illness were reported in Shunde District from the "Foshan Student Health Monitoring Information System" from 2015 to 2018 school years, with an absence rate of 0.28%. The main cause of absence was the common cold (69.82%). The number of absences in the second semester was more than that in the previous semester, and the distribution of absences due to various causes was different. There were significant differences in absenteeism due to illness between towns and streets with different economic levels (χ^2=5724.20, P<0.001), and there were significant differences in absenteeism due to illness between different months and grades (χ^2=960483.68, P<0.001).

K. Keerthana et al., (2021) published "Assessment of the Level of Knowledge and Practices on Hand Hygiene among School Going Children at Selected Districts, Tamil Nadu, India". The objectives were to assess the existing level of knowledge and practice of school going children on hand washing, to find out the correlation between level of knowledge and practice on hand washing among school going children and to find out the association between level of knowledge and practices of school going children on hand washing with their selected demographic variables. The study subjects were 50 school children in Selected Districts, Tamil Nadu, India. The results were: In the level of knowledge majority of the school going children (52%) had inadequate knowledge, 28% of them were had moderately adequate knowledge and only 20% of them had adequate knowledge. The mean knowledge score on hand washing was 10.4

and the standard deviation was 4.31. The mean practice score on hand washing was 21.52 and the standard deviation was 7.4.

Jatrana Santosh et al., (2021) published "Global Variation in Hand Hygiene Practices Among Adolescents: The Role of Family and School-Level Factors" with the aim of gaining a comprehensive understanding of the hand hygiene habits of adolescents around the world, assessing their regional and national differences, and exploring the key factors that drive the formation of these habits to help guide effective health promotion policies and interventions. The research subjects were nationally representative data from the Global School Student Health Survey (2003-2017) from 92 countries. Results: Among 354,422 adolescents (13–17 years), only 30.3% were found to practice appropriate hand hygiene. Multivariable models suggest that sedentary behavior (adjusted relative risk ratio (ARRR) 1.41, 95% CI 1.31–1.51)), and bullying victimization (ARRR 1.20, 95% CI 1.10–1.30) promoted inappropriate HHP. In contrast, parental supervision (ARRR 0.55, 95% CI 0.50–0.59) and parental bonding (ARRR 0.81, 95% CI 0.75–0.87) were protective against inappropriate HHP.

Chen Liang et al., (2021) published "Evaluation of the effect of hand hygiene intervention on children in kindergartens in Changping Town, Dongguan City". The purpose is to evaluate the effect of hand hygiene intervention on children in kindergartens in Changping Town and provide a reference for the promotion of hand hygiene health in kindergartens. The research subjects were 844 children in 24 classes of 3 kindergartens in Changping Town. The results showed that there was no statistically significant difference in gender and household registration of children before and after the intervention (all $P>0.05$). After the first intervention, the scores of parents' hand hygiene cognitive behavior and children's hand hygiene behavior

increased from 2.18 and 2.22 to 2.35 and 2.39, respectively (all P<0.01). After the second intervention, the total absenteeism rate of kindergartens with high absenteeism rates and the absenteeism rate of respiratory symptoms in small and moderate classes of 3 kindergartens decreased from 7.09%, 7.58%, and 3.01% to 3.01%, 4.38%, and 2.23%, respectively (all P<0.01). In short, the intervention measures can promote children to establish good hand hygiene habits, effectively improve children's hand hygiene conditions and reduce absenteeism due to respiratory diseases.

Munn Zachary et al., (2020) published "Rinse-free hand wash for reducing absenteeism among preschool and school children". Objective: To investigate if the use of rinse-free hand wash can reduce the number of days spent absent from school in preschool and school children compared to no rinse-free hand wash usage. The subjects were 30,747 children aged 2 to 18 years who were attending preschool (nursery, daycare, kindergarten, etc.) or school (primary school, middle school, elementary school, etc.) in the United States, Spain, China, Colombia, Finland, France, Kenya, Bangladesh, New Zealand, Sweden, and Thailand. The results were as follows: The application of, and adherence to a rinse-free hand wash, hand hygiene program may be associated with small, but potentially beneficial effects in reducing the number of days students were absent from school due to illness compared to no rinse-free hand wash, hygiene program. However, rinse-free hand washing may be no different to controls at reducing absenteeism for any reason.

Ding Yu et al., (2020) published "Survey on Handwashing Behavior of Children in Childcare Institutions in Huzhou City". The purpose was to understand the current status of handwashing behavior of children in childcare institutions in two districts of Huzhou City and possible influencing factors, so as to provide a basis for

carrying out health education on hand hygiene-related diseases. The research subjects were 343 children from 6 kindergartens in two districts of Huzhou City. Results A total of 1042 hand hygiene indicators of children were observed, 886 handwashing behaviors occurred (85.03%), and the overall handwashing pass rate was 53.35% (83 children); among kindergartens of different levels, the handwashing behavior of children in third-level kindergartens was poor, and as the kindergarten level increased, the correct handwashing behavior of children improved significantly; the handwashing behavior of boys was relatively poor, 45.35% of boys had unqualified handwashing behavior, and the proportion of unqualified girls was only 19.88%. The handwashing behavior of children in small classes was better than that of children in moderate classes, and the proportion of unqualified handwashing of children in small and moderate classes was 23.13% and 39.80%, respectively.

Tengku Jamaluddin Tengku Zetty Maztura et al., (2020) published Assessment on Hand Hygiene Knowledge and Practices Among Pre-school Children in Klang Valley with the aim of determining the hand hygiene knowledge and practices of preschool children. The subjects were 254 children from two kindergartens in the Klang Valley area. The survey was conducted through face-to-face interviews. The results showed that most preschool children had acquired the hand washing knowledge taught by their parents. However, only 63% showed good hand washing methods.

Mohamed Nurul Azmawati et al., (2020) published "Effect of hand hygiene intervention on the absenteeism of pre-school children in Klang Valley, Malaysia: a quasi-experimental study" with the aim of changing the behavior and health status of preschool children in Klang Valley, Malaysia. The subjects were 377 preschool children aged 5-6 in Klang Valley, Malaysia. The results showed that the total number

of absentee days in the test group increased by 25% from before the intervention to the intervention period, which was much smaller than the control group, with an increase of 89% in the control group. The results showed that during the intervention period, there was a significant difference in absenteeism between the test group and the control group ($P<0.05$). These results suggest that appropriate education and intervention can improve hand hygiene compliance, thereby improving hand hygiene compliance. It may help reduce absences due to illness; however, a longer study duration may be required to further evaluate its benefits.

Wang Jingzhong et al., (2020) published "Evaluation and Analysis of the Effect of Hand Hygiene Intervention for Young Children in Shenzhen" with the aim of evaluating the compliance of hand hygiene intervention measures for young children and the effect of reducing the incidence of hand, foot and mouth disease, and providing a basis for exploring health education methods for young children. The research subjects were children in the senior classes of 5 kindergartens in Luohu District, Shenzhen. Children were intervened through various methods such as distributing promotional materials and conducting hand hygiene knowledge training. The results showed that the compliance of kindergarten children in the intervention group at important moments (after going to the toilet, when hands were obviously dirty, and after outdoor activities) was greatly improved, which effectively improved the compliance of children's hand hygiene, and the difference was statistically significant ($\chi^2=352.8588$, $P<0.05$).

Conceptual Framework

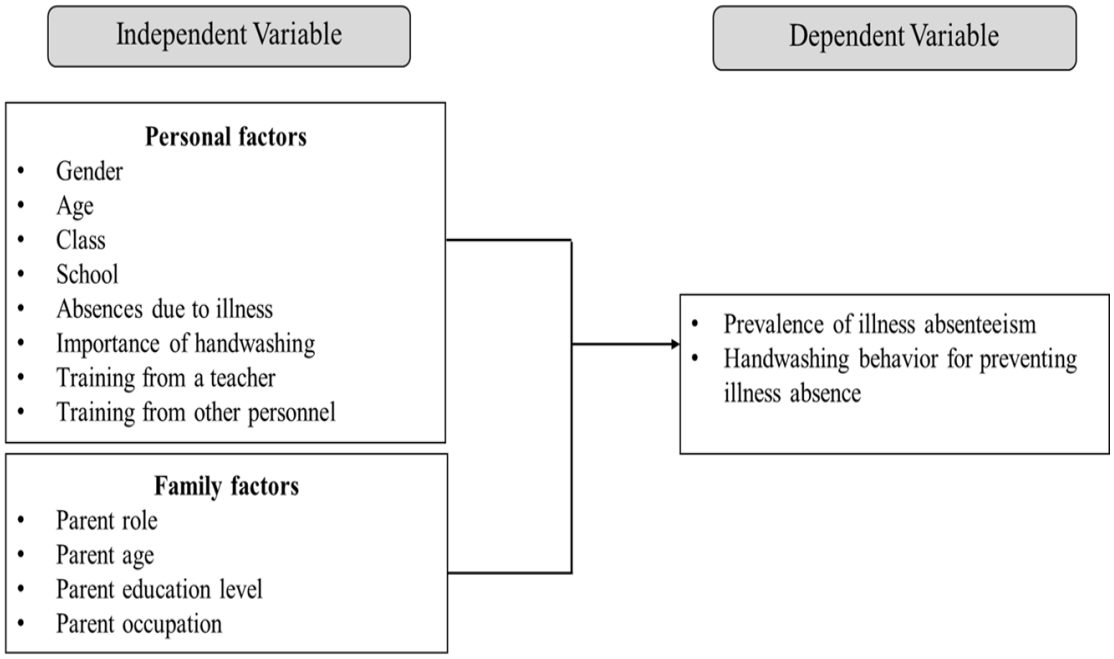

Figure 3 Conceptual Framework

CHAPTER III

RESEARCH METHODOLOGY

This chapter focused on the methodology which the prevalence of illness absence among children of kindergarten in Weishi County, the handwashing behavior among children of kindergarten in Weishi County, and the factors affecting handwashing behavior for preventing illness absence among children of kindergarten in Weishi County as follows;

1. Research design
2. Population and sample size
    2.1 Population
    2.2 Sample Size and Sampling Technique
    2.3 Inclusion Criteria
    2.4 Exclusion Criteria
3. Study area
4. Study period
5. Measurement instruments
    5.1 Measurement Tool
    5.2 Tool development process
    5.3 Research tool quality
    5.4 Reliability
6. Data collection
7. Data analysis

Research design

The research design of this study was a cross-sectional descriptive study. All samples were collected at kindergarten in Weishi County, Kaifeng City, Henan Province, China.

Population and sample size

Population

The population of this study consisted of 27 kindergartens in Weishi County, Kaifeng City, Henan Province, China. The population in this study was 2,467 children.

Sample size and sampling method

In this study, the population of 2,467 children from kindergartens in Weishi County. The subjects are determined according to the inclusion and exclusion criteria, but the proportion of researchers who withdraw from the study due to illness or unavoidable accidents is expected to be no more than 11%. The sample size was calculated by the Taro Yamane formula, the eligible participants were 383 children. In addition, representatives from 383 children's families.

$$n = \frac{N}{1 + N_{e^2}}$$

$$n = \frac{2467}{1+2467\times0.05^2} \quad n\approx345$$

Error level=345×11%=37.95 Sample size=345+38=383

n = sample size (extract the sample size for 345 subjects)

N = population (2,467 students)

e = acceptable error level (0.05)

Then consider 11% sample attrition: 345×11=37.95≈38

Sample size:345+38=383

Sampling Technique

This study used the cluster sampling method, divided into 3 size of school include large, moderate, and small schools from 27 kindergartens in Weishi County, and obtained a sampling total 3 schools. Then, the samples were grouped according to the population proportion, and stratified sampling was adopted in each school according to the inclusion and exclusion criteria. The number of samples was as follows:

Table 2 Population of population and sample size

School	Population (N)	Sample size(n)
Weihua Kindergarten in Weishi County	261	232
Weishi County Golden Cradle Kindergarten	100	89
Rende Kindergarten in Weishi County	69	62
Total	**430**	**383**

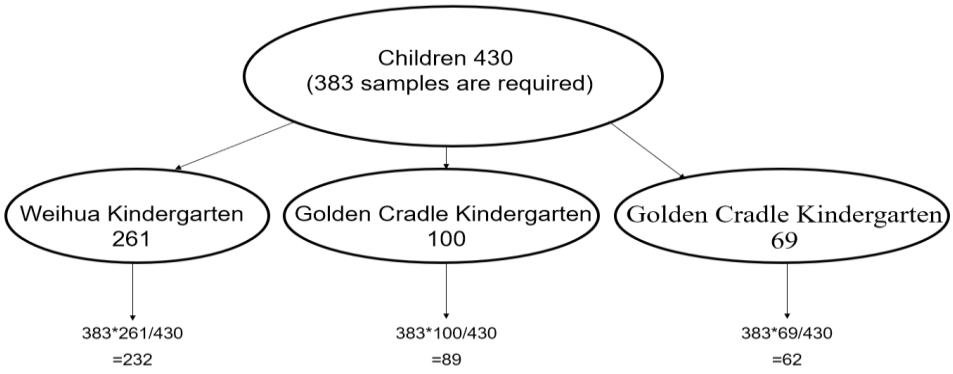

Figure 4 Sample size calculation method

Inclusion criteria

1. Parents or guardians of children aged 3-6 years old.

2.Parents or guardians of children who have been in kindergarten for 4 months.

3.A parent or guardian completes the questionnaire on behalf of the child.

4.Willing to participate in the study.

5. With informed consent obtained from parents or guardians and permission from the class teacher.

Exclusion criteria

1. Parents or guardians who are unwilling to participate in the study.

2. Children who are absent from school during the study period.

Study area

The study area of Weishi County, Henan Province, China.

Figure 5 Location map of Weishi County (Bigemap, 2024)

Study period

This study was conducted from August 2024 to March 2025.

Measurement instruments

Measurement Tool

The questionnaire should include two parts (both of which are filled out by the children's parents): the first part investigates the children's personal information and family background; the second part investigates the children's hand washing behavior and Illness absenc

Part I: Personal factors

The questionnaire respondents included gender, age, class, school, absences due to illness, importance of hand washing, training for teachers and training for other personnel.

Part II: Family factors

The questionnaire respondents included parental role, parental age, parental occupation and hygiene habits.

Part III: Illness absence

The questionnaire is designed to investigate the health status and illness-related absences among children enrolled in kindergartens in Weishi County. It specifically collects information on the number of days children were absent due to illness over the past four months. The questionnaire includes items related to common illnesses such as fever, cold, cough, diarrhea, and hand, foot and mouth disease. Additionally, it gathers data on the type of treatment received, the child was admitted to the doctor/hospital, period of absence from school, and last ill time.

Part IV: Hand washing behavior

The questionnaire and the choices of the questions correspond to different scores, "always" gets 3 points," sometimes" gets 2 points, and "never" gets 1 point. different scores can be calculated based on the different choices of the respondents. The higher the score, the better the respondent's hand-washing behavior; the lower the score, the opposite is true, and the respondent's hand-washing behavior is not good.

The questionnaire was divided into 3 level as follows:

Levels	Scores
Always	3 score
Sometimes	2 score
Never	1 score

The criteria for finding the average of the results using the formula of the width in the class interval are as follows (Pachakarma Pothibenjakul, 2007: 67).

From the formula, the width of the class interval = (highest value - lowest value)/ Number of classes = (3 − 1)/3 = 0.66.

The criteria for hand-washing behavior level are divided into 3 levels using the average score as follows:

An average score of 2. 34 - 3. 00 means good behavior.

An average score of 1. 67 - 2. 33 means moderate behavior.

An average score of 1. 00 - 1. 66 means low behavior.

Tool development process

1. Research literature, including literature related to the research, to optimize the research questionnaire.

2. Consult the supervisor's research questionnaire.

3. Submit the questionnaire to three experts for evaluation.

4. Modify the questionnaire according to expert suggestions. The above is appropriate.

5. Conduct sample tests in the study area.

Research tool quality

The accuracy of the study content requires the expert to believe that the research question is determined to meet the measured content or the purpose of the study.

A score of +1 means to be certain of the content/purpose of the question.

A score of 0 means being uncertain about the content/purpose of the question.

A score of -1 means to identify an issue without measuring its content/purpose.

index of item-objective congruence IOC.

According to the formula:

$$IOC = \Sigma R/N$$

R stands for the sum of expert reviews.

N represents the number of majors.

If the IOC criterion is 0.05 or above, then the problem is objective.

Reliability

The modified questionnaire was pre-tested on a group of 30 among children who met the criteria of the target population in Kaifeng, Henan Province, China. The data collected from this pilot test were analyzed to determine the reliability of the instrument. The section measuring hand- washing behavior demonstrated a Cronbach' s alpha coefficient of 0. 88, indicating excellent internal consistency and confirming the tool's appropriateness for use among children of kindergarten in Weishi County.

Data collection

In this researcher will follow these steps to collect data.

1. Request a letter of certification from I-SEM, Chiang Rai Rajabhat University, to authorize the data collection process.

2. Coordinate and send official letters to relevant agencies to request permission for field data collection for research.

2. Communicate the research objectives and obtain consent for data collection.

3. Conduct field visits to collect data from students and their parents.

4. Compile and verify the accuracy of the collected data for further analysis.

Data analysis

The descriptive statistic analyzed the prevalence of illness absence and handwashing behavior among children of kindergarten in Weishi County were frequencies, percentages, mean, and standard deviation.

The inferential statistics analyzed the factors affecting handwashing behavior for preventing illness absence among children of kindergarten in Weishi County as a Chi-square test

CHAPTER IV

RESULTS

This chapter aims to study the prevalence of illness absence, assess the handwashing behavior among children of kindergarten, and identify the factor associated of handwashing behavior for preventing illness absence among children of kindergarten in Weishi County, Henan Province. The results include 5 components as follows;

1. Personal factors
2. Family factors
3. Illness absence
4. Hand washing behavior
5. Factors associated of handwashing behavior for preventing illness absence

Personal factors

Table 3 Frequency and percentage of children by gender (n=383)

Gender	Number (n=383)	Percentage (%)
Male	196	51.17
Female	187	48.83
Total	**383**	**100**

In table 3, the frequency and percentage of children by gender. The majority of 196 males (51.17%), and 187 females (48.83%).

Table 4 Frequency and Percent of Children Age (n=383)

Age	Number (n=383)	Percentage (%)
3	64	16.71
4	131	34.20
5	121	31.60
6	67	17.49
Mean=4.5 Minimum=3 Maximum=6		
Total	**383**	**100**

In table 4, the frequency and percentage of children age range 3-6, the majority were 4 years old, accounting for 131 children (34.20%), followed by 5 years old with 121 children (31.60%), while the smallest group was 3 years old, comprising 64 children (16.71%).

Table 5 Frequency and Percent of Children Class (n=383)

Class	Frequency	Percent
Large class	126	32.90
Middle class	128	33.42
Small class	129	33.68
Total	**383**	**100**

In Table 5, frequency and percentage in the class of children the class with the largest number of cases was the small class with 129 cases (33.68%), followed by the moderate class with 128 cases (33.42%), and the class with the least number of cases was the large class with 126 cases (32.90%).

Table 6 Frequency and percentage of children's schools (n=383)

School	Frequency	Percent
Weihua Kindergarten	232	60.57
Golden Cradle Kindergarten	89	23.24
Rende Kindergarten	62	16.19
Total	**383**	**100**

In Table 6, the Frequency and percentage of children in school the largest number was in Weihua Kindergarten with 232 cases (60.57%), followed by Golden Cradle Kindergarten with 89 cases (23.24%), and the smallest number was in Rende Kindergarten with 62 cases (16.19%).

Table 7 Frequency and Percentage of Children Who Were ill in the Last Semester (n=383)

Semester	Frequency	Percent
Yes	383	100
Total	**383**	**100**

In Table 7, Frequency and Percentage of Children Who Were ill in the Last Semester 383 children were ill last semester (100%).

Table 8 Frequency and Percentage of Children Who Know the Importance of Hand-washing (n=383)

Importance	Frequency	Percent
Yes	256	66.84
No	127	33.16
Total	**383**	**100**

In Table 8, frequency and percentage of Children Who Know the Importance of Hand-washing 256 children (66.84%) knew the importance of hand washing, and 127 children (33.16%) did not know the importance of hand washing.

Table 9 Frequency and Percentage of Children Who Received Hand-washing Training from Teachers (n=383)

Teacher	Frequency	Percent
Yes	259	67.62
No	124	32.38
Total	**383**	**100**

In Table 9, frequency and percentage of Children Who Received Hand-washing Training from Teachers 259 children (67.62%) received teacher hand washing training, and 124 children (32.38%) did not receive teacher hand washing training.

Table 10 Frequency and Percentage of Children Who Received Hand-washing Training from Other Personnel (n=383)

Personnel	Frequency	Percent
Yes	242	63.19
No	141	36.81
Total	**383**	**100**

In Table 10, Frequency and Percentage of Children Who Received Hand-washing Training from Other Personnel 242 children (63.19%) received hand washing training for other personnel, and 141 children (36.81%) did not receive hand washing training for other personnel.

Family factors

Table 11 Frequency and percentage of children's parent roles (n=383)

Parent role	Frequency	Percent
Father	187	48.83
Mother	196	51.17
Total	**383**	**100**

In Table 11, the frequency and percentage of children's parent roles were the parent role with the largest number of cases was mothers (196 cases, 51.17%), and the parent role with the least number of cases was fathers (187 cases, 48.83%).

Table 12: Frequency and percentage of children's parents' ages (n=383)

Parent age	Frequency	Percent
28-30	132	34.46
31-33	118	30.81
34-36	133	34.73
Mean=32 Minimum=28 Maximum=36		
Total	**383**	**100**

In Table 12, the frequency and percentage of children's parents' ages range 28-36, the frequency and percentage of children's parents' ages was the max of age 34-36 years old 133 cases (34.73%) than age 28-30 years old 132 (34.46%) and min of age 31-33 years old 118 cases (30.81%).

Table 13 Frequency and percentage of children's parents' educational level (n=383)

Parent education level	Frequency	Percent
≤ junior high school	118	30.81
Senior high school	158	41.25
≥ college	107	27.94
Total	**383**	**100**

In Table 13, the Frequency and percentage of children's parents' educational level were the largest number of parents with a high school education level was 158 cases (41.25%), followed by 118 cases (30.81%) with a parent education level ≤ junior high school, and the smallest number of parents with a parent education level ≥ junior college was 107 cases (27.94%).

Table 14 Frequency and percentage of children's parents' occupations (n=383)

Parent occupation	Frequency	Percent
Worker	140	36.55
Farmer	18	4.70
Employee	116	30.29
Government/institution	52	13.58
Self-employed	57	14.88
Total	**383**	**100**

In Table 14, frequency and percentage of children' parents' occupations was the largest number of parents' occupations were workers (140 cases, 36.55%), followed by employees (116 cases, 30.29%), and the smallest number of parents' occupations were farmers (18 cases, 4.70%).

Illness absence

Table 15 The frequency and percentage of Illness absence

Illness absence	Frequency (N=383)	Percent (%)
Fever	220	57.44
Cold	250	65.27
Cough	248	64.75
Diarrhea	249	65.01
Hand foot mouth	128	33.42

In Table 15, the frequency and percentage of Illness absence was the most common. Cold was in 250 people (65.27%), followed by diarrhea in 249 people (65.01%), and the least common was hand, foot and mouth in 128 people (33.42%).

Table 16 The frequency and percentage of fever

Categorical variable for fever	Categorical variable for fever	Frequency	Percent
Type of treatment	No treatment/Rest	49	12.80
	Take care of the medicine yourself	60	15.67
	Clinic	88	22.98
	Hospital	60	15.67
The child was admitted to the doctor/hospital	Yes	143	37.34
	No	114	29.77
Period of absence from school	1-2 days	137	35.77
	3-4 days	120	31.33
Last ill time	1 month ago,	144	37.60
	2 months ago,	113	29.50

In Table 16, the frequency and percentage of Fever is that the most common one is that the last leave was one month ago, with 144 people (37.60%), followed by The child was admitted to the doctor/hospital, with 143 people (37.34%), and the least common one is Type of treatment is No treatment/Rest, with 49 people (12.80%).

Table 17 The frequency and percentage of cold

Categorical variable for cold	Categorical variable for cold	Frequency	Percent
Type of treatment	No treatment/Rest	62	16.19
	Take care of the medicine yourself	74	19.32
	Clinic	72	18.80
	Hospital	47	12.27
The child was admitted to the doctor/hospital	Yes	128	33.42
	No	127	33.16
Period of absence from school	1-2 days	63	16.45
	3-4 days	80	20.89
	5-6 days	65	16.97
	7 days or more	47	12.27
Last ill time	1 month ago,	59	15.40
	2 months ago,	84	21.93
	3 months ago,	74	19.32
	4 months ago,	38	9.92

In Table 17, the frequency and percentage of cold are the most common is that the child went to the doctor/hospitalized, with 128 people (33.42%), followed by the child did not go to the doctor/hospitalized, with 127 people (33.16%) and the least common is that the last leave was 4 months ago, with 38 people (9.92%).

Table 18 The frequency and percentage of cough

Categorical variable for Cough	Categorical variable for Cough	Frequency	Percent
Type of treatment	No treatment/Rest	58	15.14
	Take care of the medicine yourself	74	19.32
	Clinic	69	18.02
	Hospital	53	13.84
The child was admitted to the doctor/hospital	Yes	140	36.55
	No	114	29.77
Period of absence from school	1-2 days	58	15.14
	3-4 days	76	19.84
	5-6 days	64	16.71
	7 days or more	56	14.62
Last ill time	1 month ago,	58	15.14
	2 months ago,	67	17.49
	3 months ago,	77	20.10
	4 months ago,	52	13.58

In Table 18, the frequency and percentage of cough are the most common is that the child went to the doctor/hospitalized, with 140 people (36.55%), followed by the child did not go to the doctor/hospitalized, with 114 people (29.77%) and the least common is that the last leave was 4 months ago, with 52 people (13.58%).

Table 19 The frequency and percentage of Diarrhea

Categorical variable for Diarrhea	Categorical variable for Diarrhea	Frequency	Percent
Type of treatment	No treatment/Rest	59	15.40
	Take care of the medicine yourself	52	13.58
	Clinic	90	23.50
	Hospital	54	14.10
The child was admitted to the doctor/hospital	Yes	146	38.12
	No	109	28.46
Period of absence from school	1-2 days	49	12.79
	3-4 days	65	16.97
	5-6 days	92	24.02
	7 days or more	49	12.79
Last ill time	1 month ago	48	12.53
	2 months ago	66	17.23
	3 months ago	77	20.10
	4 months ago	64	16.71

In Table 19, the frequency and percentage of diarrhea are the most common is that the child went to the doctor/hospitalized, with 146 people (38.12%), followed by the

child did not go to the doctor/hospitalized, with 109 people (28.46%)and the least common is that the last leave was 1 months ago, with 48 people (12.53%).

Table 20 The frequency and percentage of Hand foot mouth

Categorical variable for Hand foot mouth	**Categorical variable for Hand foot mouth**	**Frequency**	**Percent**
Type of treatment	No treatment/Rest	31	8.09
	Take care of the medicine yourself	31	8.09
	Clinic	36	9.40
	Hospital	30	7.83
The child was admitted to the doctor/hospital	Yes	71	18.54
	No	57	14.88
Period of absence from school	1-2 days	37	9.66
	3-4 days	27	7.05
	5-6 days	36	9.40
	7 days or more	28	7.31
Last ill time	1 month ago	21	5.48
	2 months ago	44	11.49
	3 months ago	45	11.75
	4 months ago	18	4.70

In Table 20, the frequency and percentage of hand foot mouth are the most common is that the child went to the doctor/hospitalized, with 71 people (18.54%), followed by the child did not go to the doctor/hospitalized, with 57 people (14.88%) and the least common is that the last leave was 4 months ago, with 18 people (4.70%).

Hand washing behavior

Table 21 Mean, SD, and level of children's hand-washing behavior

No.	Categorical variables	Mean	SD	Level
1	You often wash your hands within a day	2.14	0.70	Moderate
2	You Wash hands before touching food and before eating	2.31	0.63	Moderate
3	You wash your hands with hand sanitizer after using the toilet	2.07	0.67	Moderate
4	You wash your hands after outdoor activities	2.38	0.64	Good
5	You wash your hands after covering your mouth and coughing	2.19	0.67	Moderate
6	You don’t wipe your hands after washing your hands	2.25	0.68	Moderate
7	You wipe your hands with a towel after washing your hands	2.16	0.59	Moderate

Table 21 (Continued)

No.	Categorical variables	Mean	SD	Level
8	You wipe your hands with disposable paper towels after washing your hands	2.28	0.74	Moderate
9	You wash your hands when you are asked to wash your hands	2.25	0.68	Moderate
10	You don’t want to wash your hands because of study/playing	2.19	0.66	Moderate
11	You wash your hands with hand sanitizer/soap for more than 15 seconds	2.19	0.72	Moderate
12	You wash your hands complete 7 steps of hand washing	2.26	0.62	Moderate
	Average total	**2.22**	**0.67**	**Moderate**

In Table 21, the shows the mean scores, standard deviations, and interpretation levels for children's hand hygiene behaviors. The overall mean score was moderate level (2.22 ± 0.67). When considering each item, the highest mean was found in item 4 "You wash your hands after outdoor activities" (2.38±0.64), which was classified as a good level, followed by item 2 "You Wash hands before touching food and before eating", which also showed a moderate level (2.31 ± 0.63). The lowest mean score was found in item 1 “You often wash your hands within a day” (3.13 ± 0.78), also categorized at the moderate level.

Table 22 Frequency and percentage of children's parents' educational level (n=383)

Hand washing behavior level	Frequency	Percent
Low	277	72.32
moderate	0	0
High	106	27.68
Total	383	100

In Table 22, the most common behavior of and washing is good behavior（277 cases,72.32%, followed by low behavior (106 cases,27.68%) and the least moderate behavior (0%).

Factors associated of handwashing behavior for preventing illness absence

Personal factors

Table 23 Relationship between gender and handwashing behaviors for preventing illness absence

Gender	Handwashing behavior		χ^2	*P-value*
	Low	Good		
Male	145(74.00%)	51(26.00%)		
Female	132(70.60%)	55(29.40%)	0.55	0.49
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 23 shows the relationship between gender and children's hand washing behavior was no statistically significant p < 0.05.

Table 24 Relationship between age and handwashing behaviors for preventing illness absence

Age	**Handwashing behavior**		χ^2	***P-value***
	Low	**Good**		
3	45(70.30%)	19(29.70%)		
4	92(70.20%)	39(29.80%)		
5	87(71.90%)	34(28.10%)	1.97	0.58
6	52(79.10%)	14(20.90%)		
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 24 shows the relationship between age size and children's hand washing behavior was not a statistically significant p < 0.05.

Table25 Relationship between class and handwashing behaviors for preventing illness absence

Class	**Handwashing behavior**		χ^2	***P-value***
	Low	**Good**		
Large class	86(68.30%)	40(31.70%)	1.65	0.44
Middle class	94(73.40%)	34(26.60%)		
Small class	97(75.20%)	32(24.80%)		
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 25 shows the relationship between class size and children's hand washing behavior was not a statistically insignificant $p < 0.05$.

Table 26 Relationship between school and handwashing behaviors for preventing illness absence

School	**Handwashing behavior**		χ^2	***P-value***
	Low	**Good**		
Weihua Kindergarten	182(78.40%)	50(21.60%)	14.45	0.001*
Golden Cradle Kindergarten	61(68.50%)	28(31.50%)		
Rende Kindergarten	34(54.80%)	28(45.20%)		
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 26 shows the relationship between school size and children's hand washing behavior was a statistically significant $p < 0.05$.

Table 27 Relationship between "Do your parents regularly tell you the importance of hand washing" and handwashing behaviors for preventing illness absence

Do your parents regularly tell you the importance of hand washing	**Handwashing behavior**		χ^2	***P-value***
	Low	**Good**		
Yes	191(74.60%)	65(25.40%)		
No	86(67.70%)	41(32.30%)	2.02	0.18
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 27 shows the relationship between parents telling their children the importance of hand washing and children's hand washing behavior was not a statistically significant $p < 0.05$.

Table 28 Relationship between "Having received training from a teacher" and handwashing behaviors for preventing illness absence

Having received training from a teacher	**Handwashing behavior**		χ^2	***P-value***
	Low	**Good**		
Yes	182(70.30%)	77(29.70%)		
No	95(76.60%)	29(23.40%)	1.69	0.22
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 28 shows the relationship between teacher training and children's hand washing behavior was not a statistically insignificant $p < 0.05$.

Table 29 Relationship between "Having received training from other personnel" and handwashing behaviors for preventing illness absence

Having received training from other personnel	**Handwashing behavior**		χ^2	***P-value***
	Low	**Good**		
Yes	172(71.10%)	70(28.90%)		
No	105(74.50%)	36(25.50%)	0.51	0.47
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 29 shows the relationship between other staff training and children's hand washing behavior was not a statistically insignificant $p < 0.05$.

Table 30 Relationship between parent role and handwashing behaviors for preventing illness absence

Parent role	**Handwashing behavior**		χ^2	***P-value***
	Low	**Good**		
Father	132(70.60%)	55(29.40%)		
Mother	145(74.00%)	51(26.00%)	0.55	0.49
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 30 shows the relationship between parent role and children's hand washing behavior was not a statistically insignificant $p < 0.05$.

Table 31 Relationship between parent age and handwashing behaviors for preventing illness absence

Parent age	**Handwashing behavior**		χ^2	***P-value***
	Low	**Good**		
28-30	95(71.97%)	37(28.03%)		
31-33	89(75.42%)	29(24.58%)	7.28	0.51
34-36	93(69.92%)	40(30.08)		
Total	277(72.32%)	106(27.68%)		

* significant at p-value < 0.05

Table 31 shows the relationship between parent age and children's hand washing behavior was not a statistically insignificant $p < 0.05$.

Table 32 Relationship between parent education level and handwashing behaviors for preventing illness absence

Parent education level	**Handwashing behavior**		χ^2	***P-value***
	Low	**Good**		
≤ junior high school	79(66.90%)	39(33.10%)	3.75	0.15
Senior high school	114(72.20%)	44(27.80%)		
≥ college	84(78.50%)	23(21.50%)		
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 32 shows the relationship between parent education level and children's hand washing behavior was not a statistically insignificant $p < 0.05$.

Table 33 Relationship between parent occupation and handwashing behaviors for preventing illness absence

Parent occupation	Handwashing behavior		χ^2	*P-value*
	Low	Good		
Worker	95(67.90%)	45(32.10%)		
Government/institution	35(67.30%)	17(32.70%)		
Farmer/Employee/Self-employed	77(82.80%)	16(17.20%)	5.96	0.20
Total	277(72.30%)	106(27.7%)		

* significant at p-value < 0.05

Table 33 shows the relationship between parent occupation and children's hand washing behavior was not a statistically insignificant $p < 0.05$.

Table 34 The relationship between illness and hand washing behaviors for preventing illness absence

Illness	Handwashing behavior		χ^2	*P-value*
	Low	Good		
Fever	170(77.27%)	50(22.73%)	6.32	0.01
Cold	181(72.40%)	69(27.60%)	0.02	0.96
Cough	178(71.77%)	70(28.23%)	0.10	0.74
Diarrhea	179(71.89%)	70(28.11%)	0.68	0.79
Hand foot mouth	94(73.44%)	34(26.56%)	0.12	0.73

* significant at p-value < 0.05

Table 34 shows that the relationship between illness and children's hand washing behavior was found to be statistically significant in the case of fever, $p < 0.05$.

CHAPTER V

CONCLUSION AND DISCUSSIONS

The title of this study was factors affecting hand washing behavior for preventing illness absence among children of kindergarten in Weishi county. This study has 3 objectives 1) to study the prevalence of illness absence among children of kindergarten in Weishi County. 2) to assess the hand-washing behavior among children of kindergarten in Weishi County.3) to identify the factor affecting hand-washing behavior for preventing illness absence among children of kindergarten in Weishi County. The study population consists of 2,467 individuals. The sample size was determined using Taro Yamane's formula, yielding a final sample of 383 individuals, This study used the cluster radom sampling .The study employed a structured questionnaire as the primary research instrument, comprising the following sections: part 1:personal factors, part 2: family factors, part 3: illness absence, and part 4: hand washing behavior. The collected data were analyzed using statistical software, The descriptive statistic analyzed the prevalence of illness absence and assessed the hand-washing behavior among children of kindergarten in Weishi County as frequencies and percentages, mean, and standard deviation.

The inferential statistics analyzed the factors affecting hand-washing behavior for preventing illness absence among children of kindergarten in Weishi County as a Chi-square test. The study findings are structured as follows:

1. Conclusion
2. Discussion
3. Generalizability
4. Recommendation for Further Research

Conclusion

Personal factors

The majority of students were male (51.17%), mainly 4 years old (34.20%), while children in small classes (33.68%), children in Weihua Kindergarten (60.57%), and children were ill in the last semester (100%). Children who know the importance of hand-washing (66.84%), received hand-washing training from teachers (67.62%), and received hand-washing training from other personnel (63.19%).

Family factors

The main caregivers of most children are mothers (51.17%), and most parents are between 34 and 36 years old (34.73%); the education level of parents is mainly high school (41.25%), followed by junior high school and below (30.81%); the occupations of parents are mainly workers (36.55%) and employees (30.29%), and the lowest proportion is farmers (4.70%).

Illness absence

All children (100%) experienced illness during the previous term. The most common diseases were cold (65.27%), diarrhea (65.01%) and cough (64.75%), followed by fever (57.44%) and hand, foot and mouth disease (33.42%).

Hand washing behavior

The overall hand washing behavior level of children is moderate (mean score = 2.22 ± 0.67). Among them, only "washing hands after outdoor activities" reached a good level, and the other behaviors were all moderate.

Factors associated of handwashing behavior

Factors associated of handwashing behavior for preventing illness absence among children of kindergarten in Weishi County was found to be statistically significant in the case of fever.

Discussion

2.1 The prevalence of illness absence among children of kindergarten in Wei shi County. This study shows that the absence rate of kindergarten children in Weishi County due to illness is high (100%), mainly caused by cold (65.27%), diarrhea (65.01%), and cough (64.75%). This finding is consistent with the conclusion of Munn Zachary et al. (2020) published in "Rinse-free hand wash for reducing absenteeism among preschool and school children", which indicated that respiratory and intestinal infections are the core causes of children's absence. Additionally, the absenteeism rate due to hand, foot, and mouth disease (33.42%) is lower than the 50%-60% reported by Tengku Jamaluddin Tengku Zetty Maztura et al. (2020) in "Assessment on Hand Hygiene Knowledge and Practices Among Pre-school Children in Klang Valley", which may be attributed to the high vaccination coverage in China (such as EV71 vaccine) or differences in case reporting mechanisms.

2.2 The hand washing behavior of children in kindergartens in Weishi County. This study showed that the overall hand washing behavior of children in kindergartens in Weishi County was at a moderate level (mean score = 2.22 ± 0.67). Most children performed well in washing hands after outdoor activities (mean score 2.38), but there was still room for improvement in spontaneous hand washing, washing hands with

soap, and complying with the seven-step hand washing method. The results of this study are similar to those of Ding Yu et al. (2020) in the "Survey on Hand Washing Behavior of Children in Child Care Institutions in Huzhou City". Although 72.3% of children showed low to moderate compliance (Table 15), only 27.7% of children showed good hand washing habits, and there were significant differences between specific behaviors. For example, the compliance score for the seven-step hand washing method was moderate (mean = 2.26 ± 0.62), indicating that the recommended hand washing method was not fully implemented. Similarly, spontaneous hand washing (e.g., before meals) scored low (mean = 2.31 ± 0.63), indicating that children relied on external cues rather than intrinsic motivation. It is worth noting that the school environment has become an important factor (Table 25). Children in Rende Kindergarten had significantly better handwashing compliance than those in Weihua Kindergarten and Golden Cradle Kindergarten ($\chi^2 = 14.45$, $p = 0.001$). This difference may reflect differences in facility accessibility (e.g., child-friendly handwashing sinks, soap supply) or teacher engagement, as highlighted by Mohamed et al. (2020), who linked structured hygiene programs to improved compliance. Family factors were not statistically significantly associated with handwashing behavior (Tables 29-32), contradicting the view of Jatrana et al. (2021) that parental supervision is a key driver. This difference may stem from cultural norms in Weishi County, where school interventions may be more important than family practices. For example, 67.62% of children received handwashing training from teachers (Table 9), but the average score of children washing their hands with soap was only 2.07 (Table 15), which highlights the need to strengthen practical operations rather than just theoretical guidance. The high rate of incomplete hand drying (mean score for “not drying hands” = 2.25 ± 0.68)

further exacerbated the risk of infection, as wet hands facilitate the spread of pathogens (Jefferson et al., 2020). Targeted interventions, such as installing convenient paper towel holders or promoting air dryers, could fill this gap. In addition, the low score for hand washing duration (mean score for "hand washing time > 15 seconds" = 2.19 ± 0.72) is consistent with the findings of Keerthana et al. (2021), who found that Indian schoolchildren had poor knowledge of hand washing duration and highlighted the need for interactive training (e.g., using a timer or singing) to improve hand washing skills. Overall, children's hand washing behavior was generally good, but lacked consistency and initiative. In addition, hand hygiene education interventions have been shown to significantly improve children's hand hygiene habits (Chen Liang et al., 2021), suggesting that it is necessary to continuously reinforce hand washing habits in Weishi County, especially before meals and after going to the toilet.

2.3 The factors associated with handwashing behavior and prevention of illness absence among kindergarten children in Weishi County. This study showed a statistically significant correlation between school type and handwashing behavior (χ^2 = 14.45, p = 0.001). Children in Rende Kindergarten had higher handwashing compliance than those in Weihua Kindergarten and Golden Cradle Kindergarten. This difference may stem from school infrastructure (e.g., the convenience of handwashing stations, the availability of soap and towels), teacher-led hygiene programs, and the importance that schools place on health education. For example, Rende Kindergarten may have more systematic hygiene procedures and more frequent teacher-led demonstrations, which is consistent with the findings of Chen Liang et al. (2021), who found that schools that implemented systematic handwashing interventions significantly reduced absenteeism. This highlights the critical role of the school

environment in shaping hygiene habits, especially in settings where resources are limited and interventions at the home level may be inconsistent. Contrary to the expected results, individual factors such as gender ($p = 0.49$), age ($p = 0.58$), and class size ($p = 0.44$) were not significantly associated with handwashing behavior. This may reflect the homogeneity of hygiene education across classes in kindergartens in Weishi County, where standardized curriculum and teacher supervision take precedence over individual differences. In addition, young children's reliance on adult guidance (rather than autonomous decision- making) may weaken the influence of individual characteristics. Surprisingly, parents' education level ($p = 0.15$) and occupation ($p = 0.20$) were not statistically significant. This is in stark contrast to the findings of Cao Yuan et al. (2022), which linked parents' education level to children's hygiene habits. One possible explanation is the limited socioeconomic diversity in the sample—most parents have a high school education (41.25%) or work in similar occupations (e.g., 36.55% are workers). Children who understood the importance of hand washing (66.84%), received teacher hand washing training (67.62%), and received training from other personnel (63.19%) generally showed better hand hygiene behaviors. This finding is consistent with the study published by Jatrana Santosh et al. (2021) in "Global Differences in Hand Hygiene Habits among Adolescents", which emphasized that parental supervision, school education, and family support significantly affect children's hand hygiene habits. This study found that family factors, especially parents' education level and occupation, were closely related to children's hand hygiene habits, indicating that the family environment plays a vital role in cultivating children's healthy behaviors. Therefore, comprehensive interventions that combine school education with

family participation are an important strategy to improve children's hand washing behavior and reduce absenteeism due to illness.

This study showed that there was a statistically significant correlation between fever and hand washing behavior. Fever is a common clinical manifestation of respiratory or gastrointestinal infection in young children, which is usually transmitted through direct or indirect hand contact. Since kindergarten children live and learn in close contact, their immune systems are still in the development stage, their self-hygiene awareness is weak, and they are more susceptible to infectious diseases. Hand washing is considered to be one of the most effective and economical ways to prevent infectious diseases. Studies have shown that interventions to improve hand hygiene in educational settings can significantly reduce the spread of bacteria and viruses that cause respiratory and other symptoms (Mo et al., 2022; Mahmud et al., 2020). This study found that most children had received hand washing training from teachers (67.62%) and other personnel (63.19%), which may help reduce the incidence of diseases including fever. This result is also consistent with the study of Munn et al. (2020), who found that adherence to hand hygiene interventions helped reduce absences from school-age children due to illness. Similarly, the intervention measures carried out by Chen Liang et al. (2021) in kindergartens in Changping Town significantly reduced absenteeism due to respiratory symptoms (including fever) after two rounds of hand hygiene education. Differently, the study by Long & Peng (2024) showed that although not washing hands before meals is an important risk factor for infectious diarrhea, there was no statistically significant association between washing hands after defecation and the onset of the disease, which suggests that the timing and quality of

hand washing may play a more important role than the frequency of hand washing alone.

Generalizability

The results are applicable to urban kindergartens in Henan Province, China, with a moderate socioeconomic level and relatively complete educational resource allocation.

1. Rural areas: Inadequate infrastructure (such as tap water and hand sanitizer supply) may weaken the intervention effect.

2. High-income countries: Excellent sanitary conditions, high health literacy of parents, and different drivers of hand-washing behavior (such as greater reliance on autonomy rather than external reminders).

3. Non-collective environments: The conclusions are not directly applicable to families or non-kindergarten educational institutions.

Recommendation for Further Research

Mechanism deepening:

1. Explore children's psychological motivation (such as the impact of " handwashing gamification" on behavior) and economic factors (such as the relationship between family income and access to handwashing resources).

2. Quantify the direct effect of environmental variables (such as water quality testing, and soap consumption) on hand hygiene.

Intervention innovation:

1. Design a hybrid intervention model based on "home-school linkage" (such as parent workshop + campus handwashing check-in system).

2. Test the applicability of low-cost facility improvements (such as portable handwashing stations) in resource-poor areas.

Policy support:

1. Promote regional hand hygiene education standardization (such as incorporating the seven-step handwashing method into the compulsory curriculum of kindergartens).

2. Cooperate with public health departments to monitor the long-term association between handwashing facility coverage and childhood infectious diseases.

Cross-cultural comparison:

Compare the differences in handwashing behavior between urban and rural, Chinese and foreign kindergartens, and identify the moderating effects of cultural or economic background.

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APPENDIX

Appendix A

Interview forms

Factor affecting handwashing behavior for preventing illness absence among children of kindergarten in Weishi County

Consent Day Date.....Month.....Year.....

I am Mr. / Mrs. / Miss. . . . . .

address.....

Read the details from the information sheet for participants in the research project and I agree to voluntarily participate in the research project.

I have received a copy of the consent form that I signed and dated, along with an information sheet for research participants. This is before signing the consent form to conduct this research. I explained to the researcher the purpose of the study. The duration of the research, research methods, dangers or symptoms that may arise from the research. or from the medicine used Including the benefits that will emerge from the research and guidelines for treatment by other methods in detail, I have had enough time and opportunity to ask questions until I have a good understanding. The researcher answered various questions willingly and without concealment until I was satisfied.

I have the right to terminate my participation in the research project at any time. There is no need to inform the reason. and termination of my involvement in this research It will not affect treatment or other rights that I will continue to receive.

The researcher guarantees that my personal information will be kept secret. and will be disclosed only with my consent. Other persons on behalf of the research sponsoring company Human Research Ethics Committee the Food and Drug Administration may be permitted to inspect and process my information. This must be done to verify the accuracy of the information only. By agreeing to participate in this study, I am giving consent to have my medical history reviewed.

I have read the above and have a complete understanding of it. Willing to participate in research willingly. Therefore, signed this consent document.

.....Sign the person giving consent.

(.....) Name of person giving consent

Date .....Month.....Year.....

I have explained the purpose of the research, the research methods, dangers or adverse reactions or risks that may arise from the research. or from the medicine used Including the benefits that will arise from thorough research. Let the participants in the research project named above know and have a good understanding. Ready to sign the consent document willingly

.....

Signed by the researcher

(.....)

Name of the researcher in detail

Date .....Month……..Year…….

.....	.....
Witness signature	Witness signature
(.....)	(.....)
Name of witness in detail	Name of witness in detail
Date .....Month…..Year…….	Date .....Month……..Year…….

Factor affecting handwashing behavior for preventing illness absence among children of kindergarten in Weishi County

…….

Dear Participants

The research study will be conducted on this survey the factor affecting handwashing behavior for preventing illness absence among children of kindergarten in Weishi County. The participants in this study are voluntary and the information you give us will be confidential, which means your name will not be mentioned anywhere and information provided by you will be presented only in a summarized form.

Please select carefully the answer for each question and the possible responses. Choose and mask (√) the response option that best represents your opinion, knowledge, attitude, and practice. Please notify the interviewer if you any concern about of the questions or other problem.

The questionnaire is divided into 4 parts as follows;

Part I: Personal factors

Part II: Family factors

Part III: Illness absence

Part IV: Hand washing behavior

The researcher hopes for your cooperation very much and I would like to thank you very much for this opportunity.

Zhang Jinyu

Master of Public Health

Chiang Rai Rajabhat University

Part I: Personal factors

Guidance: Please select carefully the answer for each question and choose the answer by marking (√) the response option that best represents.

Details	**Code**
1. Children's Gender	Gender……..
( ) Male ( ) Female	
2. Children's Age ……. years	Age……
3. Children's Class	Class……..
( ) Large class ( ) Middle class ( ) Small class	
4. Children's School	School…….
( ) Weihua Kindergarten in Weishi County ( ) Weishi County Golden Cradle Kindergarten ( ) Rende Kindergarten in Weishi County	
5. Have you been absent from school due to illness in the past semester? (such as cold, fever, stomachache, etc.)	semester…
( ) Yes …….. times ( ) No	
6. Do your parents regularly tell you the importance of hand washing	importance …
( ) Yes ( ) No	
7. Having received training from a teacher	Teacher…….
( ) Yes ( ) No	
8. Having received training from other personnel	Personnel…….
( ) Yes ( ) No	

Part II: Family factors

…….

Guidance: Please select carefully the answer for each question and choose the answer by marking (√) the response option that best represents.

Details	**Code**
1. Parent role	role**….**
( ) Father ( ) Mother ( ) Grandparents	
2. Parent age……. years	Parentage**….**
3. Parent education level	education**…….**
( ) ≤ junior high school ( ) Senior high school ( ) ≥ college	
4. Parent occupation	occupation**….**
( ) Worker ( ) Farmer ( ) Employee ( ) Government/institution ( ) Self-employed ( ) Unemployed ( ) Other	

Part III: Illness absence

Guidance: Please select carefully the answer for each question and choose the answer by marking (√) the response option that best represents in the past 4 months.

Details	Fever	Cold	Cough	Diarrhea	Hand foot mouth
1. School absence due to illness	( ) Yes ( ) No	( ) Yes ( ) No	( ) Yes ( ) No	( ) Yes ( ) No	( ) Yes ( ) No
2. Type of treatment	( ) No treatment /Rest ( ) Take care of the medicine yourself ( ) Clinic ( ) Hospital	( ) No treatment /Rest ( ) Take care of the medicine yourself ( ) Clinic ( ) Hospital	( ) No treatment /Rest ( ) Take care of the medicine yourself ( ) Clinic ( ) Hospital	( ) No treatment /Rest ( ) Take care of the medicine yourself ( ) Clinic ( ) Hospital	( ) No treatment /Rest ( ) Take care of the medicine yourself ( ) Clinic ( ) Hospital

3. The child was admitted to the doctor/hospital	( ) Yes ( ) No	( ) Yes ( ) No	( ) Yes ( ) No	( ) Yes ( ) No	( ) Yes ( ) No
4. Period of absence from school	( ) 1-2 days ( ) 3-4 days ( ) 5-6 days ( ) 7 days or more	( ) 1-2 days ( ) 3-4 days ( ) 5-6 days ( ) 7 days or more	( ) 1-2 days ( ) 3-4 days ( ) 5-6 days ( ) 7 days or more	( ) 1-2 days ( ) 3-4 days ( ) 5-6 days ( ) 7 days or more	( ) 1-2 days ( ) 3-4 days ( ) 5-6 days ( ) 7 days or more
5. Last ill time	( ) 1 month ago ( ) 2 month ago ( ) 3 month ago ( ) 4 month ago	( ) 1 month ago ( ) 2 month ago ( ) 3 month ago ( ) 4 month ago	( ) 1 month ago ( ) 2 month ago ( ) 3 month ago ( ) 4 month ago	( ) 1 month ago ( ) 2 month ago ( ) 3 month ago ( ) 4 month ago	( ) 1 month ago ( ) 2 month ago ( ) 3 month ago ( ) 4 month ago

Part IV: Hand washing behavior

…….

Guidance: Please select carefully the answer for each question and choose the answer by marking (√) the response option that best represents.

Details	Always	Sometimes	Never	Code
1. You often wash your hands within a day	( ) 3 point	( ) 2 point	( ) 1 point	within…
2. You Wash hands before touching food and before eating	( ) 3 point	( ) 2 point	( ) 1 point	touching…..
3. You wash your hands with hand sanitizer after using the toilet	( ) 3 point	( ) 2 point	( ) 1 point	toilet……..
4. You wash your hands after outdoor activities	( ) 3 point	( ) 2 point	( ) 1 point	outdoor……
5. You wash your hands after covering your mouth and coughing	( ) 3 point	( ) 2 point	( ) 1 point	covering…
6. You don't wipe your hands after washing your hands	( ) 3 point	( ) 2 point	( ) 1 point	Don'twipe ….
7 You wipe your hands with a towel after washing your hands	( ) 3 point	( ) 2 point	( ) 1 point	Towel……

8. You wipe your hands with disposable paper towels after washing your hands	( ) 3 point	( ) 2 point	( ) 1 point	Paper…..
9. You wash your hands when you are asked to wash your hands	( ) 3 point	( ) 2 point	( ) 1 point	asked….
10. You don't want to wash your hands because of study/playing	( ) 3 point	( ) 2 point	( ) 1 point	study…….
11. You wash your hands with hand sanitizer/soap for more than 15 seconds	( ) 3 point	( ) 2 point	( ) 1 point	period……
12. You wash your hands complete 7 steps of hand washing	( ) 3 point	( ) 2 point	( ) 1 point	steps……

Appendix B

Validity and Reliability

Serial number	Details	Expert opinion rating			Total score	IOC	Summary
		1	2	3			
1	Children's Gender	+1	+1	+1	3	1	/
2	Children's Age	+1	+1	+1	3	1	/
3	Children's Class	+1	+1	+1	3	1	/
4	Children's School	+1	+1	+1	3	1	/
5	Have you been absent from school due to illness in the past semester? (such as cold, fever, stomachache, etc.)	+1	+1	+1	3	1	/
6	Do your parents regularly tell you the importance of hand washing	+1	+1	+1	3	1	/
7	Having received training from a teacher	+1	+1	+1	3	1	/
8	Having received training from other personnel	+1	+1	+1	3	1	/

Serial number	Details	Expert opinion rating			Total score	IOC	Summary
		1	2	3			
1	Parent role	+1	+1	+1	3	1	/
2	Parent age	+1	+1	+1	3	1	/
3	Parent education level	+1	+1	+1	3	1	/
4	Parent occupation	+1	+1	+1	3	1	/

Serial number	Details	Expert opinion rating			Total score	IOC	Summary
		1	2	3			
1	You often wash your hands within a day	+1	+1	+1	3	1	/
2	You Wash hands before touching food and before eating	+1	+1	+1	3	1	/
3	You wash your hands with hand sanitizer after using the toilet	+1	+1	+1	3	1	/
4	You wash your hands after outdoor activities	+1	+1	+1	3	1	/
5	You wash your hands after covering your mouth and coughing	+1	+1	+1	3	1	/
6	You don’t wipe your hands after washing your hands	+1	+1	+1	3	1	/
7	You wipe your hands with a towel after washing your hands	+1	+1	-1	2	0.7	/

8	You wipe your hands with disposable paper towels after washing your hands	+1	+1	+1	3	1	/
9	You wash your hands when you are asked to wash your hands	+1	+1	+1	3	1	/
10	You don’t want to wash your hands because of study/playing	+1	+1	+1	3	1	/
11	You wash your hands with hand sanitizer/soap for more than 15 seconds	+1	+1	+1	3	1	/
12	You wash your hands complete 7 steps of hand washing	+1	+1	+1	3	1	/

Serial number	Details	Expert opinion rating			Total score	IOC	Summary
		1	2	3			
1	School absence due to illness	+1	+1	+1	3	1	/
2	Type of treatment	0	+1	+1	2	0.7	/
3	The child was admitted to the doctor/hospital	0	+1	+1	2	0.7	/
4	Period of absence from school	0	+1	+1	2	0.7	/
5	Last ill time	0	+1	+1	2	0.7	/

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.889	.888	12

BIOGRAPHY

Name - Surname Ms. Zhang Jinyu

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Current address

House number:No. 89 Subdistrict Bandu District Mueang Province Chiang Rai

Educational record

Date: September 2019 - June 2023 (Undergraduate)

Graduated from: Hainan Vocational University of Science and Technology.

Date September 2016 - June 2019 (High School)

Graduated from: Weishi County No. 3 Senior High School, Weichuan Campus

Date: September 2013 - June 2016 (junior high school)

Graduated from: Weishi County No. 2 Junior High School

Date: September 2007 - June 2013 (primary school)

Graduated from: Kaifeng No. 3 Normal School Attached Primary School

Work experience

Date: July 2023-January 2024, Workplace: Hainan Vocational University of Science and Technology

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