Çankırı Karatekin University
Graduate School of Health Sciences

Master of Science Thesis

ASSESSMENT OF KNOWLEDGE AND PRACTICE OF NURSING STUDENTS IN THE PREVENTION OF SURGICAL SITE INFECTION RELATION COPING STRATEGIES

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Advisor

Asst. Prof. Dr. Temel KALAFAT

Çankırı 2023

ASSESSMENT OF KNOWLEDGE AND PRACTICE OF NURSING STUDENTS IN THE PREVENTION OF SURGICAL SITE INFECTION

BY

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The Institute of Health Sciences
The Department of Nursing

The Degree of Master of Science

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ACCEPTANCE AND APPROVAL

Khalid Sabhan Khalaf KHALAF, the graduate student of The Institute of Health Sciences with the student number of 208205255, has successfully presented her thesis entitled "**Assessment of knowledge and practice of nursing students in the prevention of surgical site infectıon**" before the jury whose signatures are below, after fulfilling all of the requirements determined by the relevant regulations for the degree of Master of Science:

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ETHICS STATEMENT

The thesis entitled “Assessment of knowledge and practıce of nursıng students ın the preventıon of surgıcal sıte ınfectıon” which was prepared and presented as a thesis, was written by myself and in accordance with the scientific, academic rules and ethical conduct. The idea/hypothesis of my thesis solely belongs to my supervisor and to me. The research pertaining to the thesis was conducted by myself and therefore, all of the used sentences and interpretations within the work belongs to me.

I declare the aforementioned issues to be correct.

Signature

11/05/2023

Khalid Sabhan Khalaf KHALAF

ABSTRACT

ASSESSMENT OF KNOWLEDGE AND PRACTICE OF NURSING STUDENTS IN THE PREVENTION OF SURGICAL SITE INFECTION

Khalid Sabhan Khalaf KHALAF

Master of Science in Nursing

Advisor: Asst. Prof. Dr. Temel KALAFAT

May 2023

Objective: The aims of thise study is to determine and assessment the knowledge and practice of nursing students in the prevention of surgical site infection. Sample of this cross-sectional descriptive study included 217 nursing students from Kirkuk university and Alkitab university in Iraq. Methodology: A descriptive cross-sectional study was conducted between September - December at Kirkuk university and Al_Kitab National university. Nursing students are made up of these universities. The study sample consisted of 217 male and female students who agreed to participate in the study at the time of data collection. The Personal Information Form, Nurses' Knowledge Scale and Nurses Practice were used to collect data. Results: According to the findings, it was seen that the level of knowledge about the prevention of surgical site infection of the students studying at both universities was above the average (91.2%). At the same time, it is seen that the vast majority of students perceive their practice skills as sufficient (76%). When the demographic variables related to the applications are examined, it is seen that the application skills of the individuals in the 23-26 age group are perceived to be higher than the individuals aged 18-22 and 27-30 years. At the same time, women see themselves as more competent than men in terms of practice skills. While there is a differentiation in the level of knowledge of the students according to the university of education, there is no difference in perception of the level of practice. In the study, no difference was found in terms of SSI knowledge level and practices according to the grade level, marital status and time they studied. When analyzed according to income level, it is seen that students who are not satisfied with their income level perceive their SSI knowledge level more than students who are satisfied. However, the same

difference was not found to be significant in terms of perception of application competencies. Conclusion: The results of the study showed that the knowledge and practices of nursing students about the prevention of surgical site infection are generally good.

2023, 70 pages

Keywords: Infection, Knowledge, Nursing students, Practices, Surgical site

ÖZET

CERRAHİ ALAN ENFEKSİYONUNUN ÖNLENMESİNDE HEMŞİRELİK ÖĞRENCİLERİNİN BİLGİ VE UYGULAMALARININ DEĞERLENDİRİLMESİ

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Amaç: Sağlık sektöründe çalışan kişilerin mikroorganizmalara maruz kalma sonucu hastalanma olasılığı genel nüfusa göre daha yüksektir. Bazıları potansiyel olarak ölümcül olan hastalıkları getirme yeteneğine sahiptir. Hemşirelik öğrencileri (NS) pratik mesleki maruziyetleri sırasında istenmeyen kontaminasyon nedeniyle bu tür hastalık ve yaralanma riski altındadır (Kosgeroglu vd. 2004). Ancak hemşirelik öğrencilerinin yaşadığı risk, çalışan hemşirelerin karşılaştığı tehlikeden çok daha azdır. Hastalar, sağlık hizmetiyle ilişkili enfeksiyonların en yaygın kurbanlarıdır ve bunu hastane personeli, öğrenciler ve eğitimciler izlemektedir. Eğitimciler ve öğrencilerin enfekte olma olasılığı en düşük olanlardır. İstilacı prosedürler söz konusu olduğunda, genel halk hemşireler, hemşirelik öğrencileri ve diğer tıp uzmanlarından daha düşük bir risk altındadır. Stefanati vd. (2016) İtalya'da yaptıkları çalışmada, biyolojik risk içeren mesleki yaralanmaların hemşireler arasında yaygın olduğu bulunmuştur. Aynı zamanda hemşirelik öğrencileri ile de yaptıkları çalışmada enfeksiyon oranlarının aktif çalışan hemşirelere göre daha düşük oldukları bulunmuştur. Uygun ve güncel üniversite eğitimi, kişisel koruyucu ekipmanların doğru kullanımı gibi değişkenler nedeniyle bu durum gösterilmiştir (Stefanati vd. 2016). Bu anlamda enfeksiyon kontrolü başta hemşireler olmak üzere tüm sağlık çalışanları için önemli bir konudur. Hemşirelik öğrencilerinin hastanedeki eğitimleri sırasında hem kendi kendine enfeksiyon kapma hem de hastalara bulaştırma riski yüksektir. Hemşirelik öğrencilerinin uygulama standartlarının düşük olması, özellikle açık yara/bölge ameliyatlarında enfeksiyon bulaşmasına neden olabilmektedir. Bu nedenle hemşirelik öğrencileri, hasta bakım

kalitesini artırmak için cerrahi alan enfeksiyonunun (CAE) önlenmesi konusundaki bilgi ve uygulama düzeylerini belirlemek için önemli bir hedef kitle olarak görebilirler. Bu nedenle bu araştırmanın amacı, hemşirelik öğrencilerinin cerrahi alan enfeksiyonu yayılımını azaltmak için cerrahi alan enfeksiyonu hakkındaki görüşlerini araştırmaktır. Yöntem: Bu çalışmayı yürütmek için kullanılan araştırma modeli kesitsel bir tasarımdır. Kerkük Üniversitesi ve Al_Kitab Ulusal Üniversitesi'nden hemşirelik öğrencilerini temsil edecek bir grup kolayda örnekleme yoluyla belirlendi. Bu örnekleme yönteminde araştırmacı, yığının her bir parçasından yığını en iyi şekilde temsil ettiğine inandığı birimleri seçmeye çalışır. Bu tercih kişiden kişiye farklılık göstermektedir (Büyüköztürk vd. 2008). Bu üniversitelerdeki toplam öğrenci sayısı 500 öğrencidir. Yapılan uygunluk analizine göre örneklem büyüklüğü 217 olarak belirlenmiştir. Evren örnekleminin tamamına ulaşılması amaçlanmakla birlikte çalışma güvenirliği için istatistiksel bir örneklem hesaplaması yapılmıştır. Toplam 250 anket dağıtıldı, 217 tanesi tamamlandı. Dersleri, gelir memnuniyetleri ile ilgili soruları cevaplamayan veya anketi yanlış bir şekilde cevaplamayan yaklaşık 33 katılımcı öğrenci hariç tutuldu. Veri toplama aracı olarak, öğrencilerin cinsiyet, gelir düzeyi, sınıf gibi bilgilerinin alındığı kişisel bilgi formu, hemşirelik öğrencilerinin bilgi düzeylerini değerlendirmek amacıyla ise Qasem and Hweidi (2017) tarafından geliştirilen 9 maddelik anket kullanılmıştır. Hemşirelik öğrencilerinin uygulama pratiklerinin değerlendirilmesi ise Sham vd. (2021), tarafından geliştirilen 25 maddelik anket ile ölçülmüştür. Verilerin analizinde öncelikle verilerin normal dağılıma uygunluğu kontrol edilmiştir. Verilerin normal dağılım göstermediği görülmediği için gruplar arası farkların incelenmesinde parametrik olmayan analiz yöntemleri tercih edilmiştir. Aynı zamanda öğrencilerin hemşirelik uygulamalarına ilişkin bilgi düzeyleri frekans dağılımları ile incelenmiştir. Bulgular: Çalışmaya katılan 217 öğrenciden 18-22 yaş arası 100 öğrenci en yüksek yüzdeyi (%46,1) kaydederken, 27-30 yaş arası yaklaşık 22 öğrenci (%10,1) kaydedilmiştir. Katılımcıların cinsiyeti belirlenirken erkek katılımcılar (%60,8), kadın katılımcılara (%39,2) göre ağırlıktadır. Medeni duruma ilişkin bulgulara bakıldığında evli olanlara (%26,7) kıyasla katılımcıların çoğu bekardır (%73,3). Sonuçlar, hemşirelik öğrencilerinin çoğunluğunun (%91,2) cerrahi alan enfeksiyonunun (CAE) önlenmesi konusunda doğru bilgiye sahip olduğunu göstermektedir. Aynı zamanda öğrencilerin cerrahi alan uygulamaları ile ilgili pratik yapma düzeyleri değerlendirilmiştir. Sonuçlar, hemşirelik öğrencilerinin üçte

ikisinden fazlasının (%76) cerrahi alan enfeksiyonunun önlenmesi konusunda iyi uygulamalar sergilediğini göstermiştir. Elde edilen veriler incelendiğinde hemşirelerin uygulama düzeylerinin orta düzeyde olduğu söylenebilir. Hemşirelik öğrencilerinin yaşlarına göre cerrahi alan enfeksiyonlarını önleme konusundaki bilgilerinde istatistiksel olarak anlamlı fark bulunmazken, uygulamalarda anlamlı farklılık vardı. Elde edilen sonuçlara göre 23-26 yaş aralığındaki bireylerin, 27-30 yaş aralığındaki bireylerin, 27-30 yaş aralığındaki bireylerin 18-22 yaş aralığındaki bireylere göre daha pratik imkanlara sahip olduğunu göstermektedir. Hemşirelik öğrencilerinin cinsiyetlerine göre cerrahi alan enfeksiyonlarını önleme konusundaki bilgilerinde istatistiksel olarak anlamlı fark yoktur. Hemşirelik öğrencilerinin cerrahi alan enfeksiyonlarını önleme konusundaki uygulamalarında cinsiyetlerine göre ise istatistiksel olarak anlamlı farklılıklar bulunmuştur. Elde edilen sonuçlara göre kız öğrencilerin erkek öğrencilere göre daha fazla uygulama yapma olanağına sahip oldukları görülmektedir. Hemşirelik öğrencilerinin cerrahi alan enfeksiyonlarını önleme konusundaki bilgilerinde okudukları üniversiteye göre istatistiksel olarak anlamlı farklılıklar vardı. Elde edilen sonuçlara göre Kerkük Üniversitesi öğrencilerinin bilgi düzeyi Al Kitap Üniversitesi öğrencilerine göre daha yüksek bulunmuştur. Hemşirelik öğrencilerinin cerrahi alan enfeksiyonlarını önleme konusundaki bilgi düzeyleri gelir düzeylerine göre istatistiksel olarak anlamlı farklılık gösterirken, cerrahi alan enfeksiyonlarını önleme konusundaki uygulamalarında gelir düzeylerine göre istatistiksel olarak anlamlı fark bulunmamıştır. Tartışma: Elde edilen sonuçlar öğrencilerin cerrahi alan enfeksiyonu engelleme konusunda bilgi düzeylerinin yeterli olduğunu göstermektedir. Bu sonuçlar, Suudi Arabistan'da Sadia vd. (2017) yaptığı çalışma ile tutarlılık göstermektedir. Bu çalışmanın sonuçları, hemşirelik öğrencilerinin üçte ikisinden fazlasının (%76) cerrahi alan enfeksiyonunun önlenmesi konusunda iyi uygulamalar sergilediğini göstermiştir. Bu bulgu, Etiyopya'da yapılan ve cerrahi alan enfeksiyonunun önlenmesinde hemşirelik uygulamalarının iyi olduğunu ortaya koyan bir araştırma (Teshager vd. 2015) ile uyumludur. Gelir düzeyine göre incelendiğinde, gelir düzeyinden memnun olmayan öğrencilerin cerrahi alan enfeksiyonu bilgi düzeylerinin memnun olan öğrencilere göre daha fazla olduğu görülmektedir. Ancak uygulama yeterliklerinin algılanması açısından aynı fark anlamlı bulunmamıştır. Bunun nedeni, düşük gelirli öğrencilerin becerilerini geliştirmeye ve mali durumlarını

iyileştirmeye yönelik motivasyonları olabilir. Çünkü finansal getiri beklentisi, bireylerin başarısı için önemli bir motivasyon kaynağıdır (Chen ve ark. 2018). Sonuç ve Öneriler: Bu sonuçlar bize üniversitede verilen eğitimin hem bilgi hem de uygulama düzeyi açısından yeterli olması gerektiğini göstermektedir. Öğrencilere özellikle eğitimde daha fazla uygulama fırsatı vermek hemşirelik becerilerini daha iyi geliştirir. Özellikle öğrencilere cinsiyet, gelir düzeyi, sınıf farklılıkları ve sosyo-ekonomik farklılıklara göre fırsat eşitliği sağlanması eğitimi daha kaliteli hale getirecektir. Bu anlamda her iki üniversitede de (Kerkük Üniversitesi ve El Kitap Üniversitesi) öğrencilerin hemşirelik bilgi ve uygulama becerilerine ilişkin algı düzeylerinin daha fazla imkânın sunulmasıyla gelişeceği düşünülmektedir.

2023, 70 sayfa

Anahtar Kelimeler: Bilgi, Cerrahi bölge, Enfeksiyon, Hemşirelik öğrencileri, Uygulamalar,

PREFACE AND ACKNOWLEDGEMENTS

This thesis work is dedicated to my wife who has been a constant source of support and encouragement during the challenges of graduate school and life. I am truly thankful for having you in my life. This work is also dedicated to my parents and my whole family, whom have always loved me unconditionally and whose good examples have taught me to work hard for the things that I want to achieve.

Khalid Sabhan KHALAF
Çankırı-2023

CONTENTS

LIST OF ABBREVIATIONS

CDC	Centers for disease control and prevention
F	Frequency
HCAI	Health-care-associated infection
HCWs	Health care workers
HS	Highly significant
M	Mean
M.S	Mean of scores
N	Number
NS	Nursing students
%	Percentage
P-Value	Probability value
SD	Standard deviation
SP	Standard precautions
SPSS	Statistical package for the social sciences
SSI	Surgical site ınfection
U	Mann-whitney
WHO	World health organization

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1. INTRODUCTION

People who work in the healthcare business are more likely to get unwell as a result of exposure to microorganisms than the general population. Some of them are capable of bringing on diseases that are potentially fatal. Nursing students (NS) are also at risk of such diseases and injuries due to unintended contamination during their practical occupational exposure (Kosgeroglu *et al.* 2004). However, the risk that nursing students experience is far smaller than the danger that working nurses encounter.

According to Bello *et al.* (2011) and Pittet (2005), a healthcare-associated infection (HCAI) is an infection that develops as a direct consequence of getting medical treatment but did not already exist in the patient before admission. It is estimated that between 5 and 10 percent of hospitalized patients in rich nations get health care-associated infections (WHO 2008). In contrast, it is believed that the risk of contracting such an illness is between 2 and 20 times higher in less developed countries (WHO 2008).

Patients are the most prevalent victims of healthcare-associated infections (HCAI), followed by hospital staff, students, and educators. Educators and students are the least likely to get infected. When it comes to invasive procedures, the general public is at a lower risk than nurses, nursing students, and other medical professionals. According to Stefanati *et al.* (2016) from Italy, occupational injuries involving biological risk were found to be less prevalent among nursing students than they were among nurses. This was shown to be the case owing to variables such as appropriate and recent university training as well as the correct usage of personal protective equipment (Stefanati *et al.* 2016).

According to Allegranzi *et al.* (2016), health care-associated infections (HCAIs) are one of the leading causes of death that afflict a huge number of patients on a yearly basis. According to De Lissovoy *et al.* (2009), the surgical site infection (SSI) is the most

frequent healthcare-associated infection (HAI) in low- and middle-income countries, accounting for around twenty percent of all HAIs. In a study that included 75,694 patients from England, Wales, Northern Ireland, and the Republic of Ireland, the prevalence of healthcare-associated infections was found to be 7.59 percent (Owens and Stoesse 2008). Of these infections, SSI made up 14.5 percent of the total (Owens and Stoesse 2008).

(Ding *et al.* 2017) The Centers for Disease Control and Prevention (CDC) defines surgical site infection as the spread of pathogenic germs at the site of an incision, regardless of whether that site is superficial (colonization in the skin or subcutaneous fat), deep (colonization in the musculofascial layers), or internal (colonization in an organ or cavity). According to the findings of the study conducted by Bagnall *et al.* (2009), SSI affects anywhere from 3% to 5% of surgery patients. For instance, the prevalence of SSI is 1% in the United States, compared to 38% in Nigeria (Owens and Stoessel 2008), 12% in India (Labrague *et al.* 2012), and 19% in Ethiopia (Diaz and Newman 2015).

According to the World Health Organization (WHO), improved national and local reporting and monitoring systems are critical to the prevention of healthcare-associated infections (HAIs) (WHO 2018). The widespread adoption of preventive measures, including good hand hygiene procedures, particularly at the bedside and during invasive surgeries. Good training and accountability for healthcare staff (WHO 2018).

When these Standard measures are taken, the human component has a substantial effect in either increasing or decreasing the probability of developing HCAI (Cole 2007). According to Hugonnet *et al.* (2007), the risk of a nosocomial infection increases when the ratio of patients to nurses is higher. As a result, it is critical to have a sufficient number of nurses on staff (Hugonnet *et al.* 2007).

In order for an infectious agent to propagate across a healthcare system, there must first be a reservoir of the agent, a susceptible host, and a pathway for the agent to take. In the environment of a hospital, not only the employees but also the visitors run the danger of

catching an illness from a patient. An infectious illness is the outcome of a complex interaction between a potential host and an infectious pathogen. This interaction may take place everywhere in the body. Because certain organisms are capable of transmission by more than one route, the mode of transmission may vary from one species to the next. According to Siegel *et al.* (2007), infection is the outcome of a complex dynamic that takes place between a host and an infectious pathogen (Siegel *et al.* 2007).

According to Siegel *et al.* (2007), standard precautions are an approach that has been shown to be effective in avoiding and managing healthcare-associated diseases in both patients and healthcare personnel.

It is very necessary to make advancements in staff education, reporting, and monitoring systems, in addition to more effective infection control techniques, such as the application of fundamental precautions during invasive operations and the practice of good hand hygiene (Bouallègue *et al.* 2013, Patil *et al.* 2018).

The Centers for Disease Control and Prevention (CDC) and the World Health Organization have identified surgical site infections as one of the healthcare-associated infections that may be prevented to the greatest extent possible. Preoperative cleaning, surgical site skin preparation, hair removal, mechanical bowel preparation, oral antibiotics, and surgical hand preparation are some of the infection control techniques that may be used to reduce the risk of surgical site infections (SSIs) (Allegranzi *et al.* 2016, Patil *et al.* 2018). Surgical site infections (SSIs) can be prevented by following these infection control strategies (Allegranzi *et al.* 2016, Patil *et al.* 2018).

According to Tanner (2012), the eradication of surgical site infections is a primary factor in improving both patient safety and the quality of therapy. According to Ding *et al.* (2017), the bulk of the research that has been conducted on the subject of SSI has concentrated on doctors and nurses, but not nursing students (Ding *et al.* 2017).

Poor patient follow-up, inaccessible records, transferring to a new surgeon, and the absence of requirements from national registries are some of the reasons why there is a lack of data on the prevalence of infections after surgery (Agarwal *et al.* 2020). There are many additional reasons why there is a lack of data on this topic Agarwal *et al.* 2020).

Patients who have SSIs may have discomfort, fever, and skin redness, they may have a longer hospital stay, they may have greater medical expenditures, they may need financial support, and they may even pass away. The standard length of stay in the hospital for a patient who has SSI is seven days, whereas the standard length of stay for a patient who does not have SSI is eleven days. As a result of a decrease in bed turnover rates (Bhangu *et al.* 2018, Silvestri *et al.* 2018), there is increased waste of medical resources (Bhangu *et al.* 2018, Silvestri *et al.* 2018).

During the last two decades, Iraq's nursing education and training have suffered a significant hit due to a number of factors, including but not limited to: three international wars, counterinsurgency operations in the north and south, thirteen years of economic sanctions, despotism, and foreign occupation. To our relief, most people are in agreement that there should be a greater investment in nursing. Since 1990, there has been a significant decrease in the number of registered nurses working in Iraq, and many of the country's nursing leaders have gone for better opportunities elsewhere. According to the research done by Garfield and McCarthy in 2005, the results of this study have important repercussions for the profession of nursing in Iraq since it is the first study of its sort to be conducted in that nation (Garfield and McCarthy 2005).

1.1 Problem statement of study

Infection control is an important issue for all health care professionals specially nurses. Nursing students have higher risk for both self-acquiring and transmitting infections to the patients during their training in the hospital.

The low standard practice of nursing students can cause the transmission of infection especially among open wound/site surgeries. Thus, nursing students may consider as important target population to determine their level of knowledge and practice regarding prevention of surgical site infection (SSI) to increase the quality of patient care.

The purpose of this research was to investigate the opinion of nursing students about surgical site infection in order to reduce the spread of surgical site infection, the problem statement can be summarized with the following questions.

1.2 The research questions

- What is the level of the knowledge and practice of nursing students to prevent the surgical site infections?
- Assessment the relationship between the knowledge and practice of the nursing students with socio-demographic characteristics.
- Assessment the knowledge and practice of the nursing students to prevent the surgical site infection (SSI).

1.3 Limitations

The researcher faced difficulties in obtaining approvals from Iraq, and the results of data collection depend on the students' self-reports and are limited to the duration and place of the study.

2. GENERAL INFORMATION

2.1 Medical qersonnel

People who work in the health care business are referred to as health care workers (HCWs), and the performance of their jobs often requires the use of specific knowledge and abilities. They conduct research, diagnose, treat, and prevent human illness, injury, and other physical and mental difficulties in order to cater to the requirements of the populations that they serve. In addition, they improve the standard of evidence-based medical treatment by doing research and coming up with novel concepts, theories, and techniques for clinical practice. According to Gupta *et al.* (2011), one of the responsibilities of a healthcare supervisor is to oversee the work of other healthcare professionals (Gupta *et al.* 2011).

The procedures and practices of modern medicine are not without significant dangers and difficulties. It is possible for health care workers (HCWs) to be placed in danger by a combination of physical, chemical, and biological risks. Because of the nature of their employment, those who are employed in the healthcare industry are at an elevated risk of being exposed to infectious diseases as well as other biological hazards. People are most often exposed to biological hazards via the three most prevalent ways of exposure: direct touch, transmission through droplets, and airborne transmission. Because of the favorable conditions for their transmission, airborne viruses including the influenza virus, measles virus, rhinovirus, varicella virus, and SARS are more likely to flourish in healthcare facilities. According to the Centers for Disease Control and Prevention (CDC), nursing workers are responsible for more than forty percent of all NSIs worldwide, including those that occur in wealthy countries. The majority of needlestick injuries occur as a result of needle manipulation (26% of cases), sharp disposal (21% of instances), worker or sharp collision 10% of cases), clean-up 9% of cases), needle recapping 5% of cases, or surgery 1% of cases. The transmission of healthcare-associated infections (HAIs) Gupta *et al.* (2011) has been shown to be connected to this form of intimate contact between patients (Gupta *et al.* 2011),

Infections acquired while receiving medical care, sometimes known as “hospital” or “nosocomial” infections, are among the most common side effects of therapy and have the potential to be fatal. The acronym “healthcare-associated infections” (HAI) refers to infections that a patient contracts while undergoing medical treatment. A nosocomial infection is what we call the situation that arises when an inpatient at a hospital develops signs of a disease that was not present or incubating at the time of admission to the hospital. There is a considerable risk of contracting the virus in any medical setting, from the emergency department to the operation room, and even in a nursing home or an outpatient clinic. Surgical site infections (also known as SSIs, Pittet 2005, Bello *et al.* 2011) are infections that manifest themselves at the site of a surgery.

2.2 Hospital infection

Invasive illnesses often manifest themselves between 48 and 72 hours after a patient is admitted to the hospital, as a result, hospital infections do not occur when patients initially check in. There is a possible connection between this phenomena and certain medical procedures and medications, pathogens. An illness that arises in a hospital is called a nosocomial infection, which comes from the Greek words nosos, which means sickness, and comeion, which means medicine. An infection that is acquired by a patient while they are getting medical treatment is still referred to as a nosocomial infection. However, in more recent publications, the phrase health care-related sickness has been used instead of nosocomial infection. A case of an infectious disease that may be passed on to other people, such as roommates or visitors. The usual incubation period for health care-associated infections (HCAI) is between 48 and 72 hours after hospital admission and 10 days following discharge. Bringing an end to the process It is recommended that you take it for illnesses that occur throughout the day (Horan *et al.* 2008, Özturk *et al.* 2011).

Washing his hands with lemon cream in 1847 was the first step that Ignaz Philip Semmelweis took toward laying the groundwork for future study into the prevention of nosocomial infections. Semmelweis threw away the cream after seeing a decline in the rate of newborn death. After that, in the year 1867, Joseph Lister started working with

Florence Nightingale on observational studies. During these investigations, he used carbonic acid dressings to surgical wounds. Notes on Hospitals, published by Marul in 2016, was the book that catapulted him into the public eye. It is generally agreed that William Steward Holsted, a surgeon, is responsible for popularizing the use of gloves in the operating room. In 1928, Alexander Fleming made the discovery that would lead to the development of the antibiotic penicillin. And by the 1940s, it had been connected to infections, and by the 1950s, significant headway had been achieved in the fight against infections via the use of penicillin in treatment (Yıldırım 2015).

Research on the prevention of nosocomial infections was began in the 1940s. It was in the 1950s that this phenomenon first emerged in the United States and the United Kingdom, and it quickly expanded around the globe. In spite of keeping up with medical advancements, the first publication on nosocomial infections was published in 1960, nevertheless, following the year 2000, the number of studies on the subject expanded rapidly (Özturk 2011). Changes took place all over the world. Infections that are harmful and acquired in hospitals. Catheter infections have been associated to a number of consequences, including infections of the urinary tract, pneumonia, and infections of the bloodstream (Horan *et al.* 2008). Catheter infections may also induce urinary tract infections (Horan *et al.* 2008).

2.3 Surgical field infections

19th century High fever and postoperative fever in many patients up to the middle of the operation where purulent discharge is noted, sepsis develops, or death appears. As known since then, antibiotic prophylaxis, sterilization (Yıldırım 2015).

Techniques, barrier measures, improvements in surgical techniques, and surgical site infections despite improvements such as proper ventilation remains a significant problem today. Surgical site infections. It is an important issue related to the right to enjoy health and community life. Therefore, the CDC defined nosocomial infection in 1988. The field of surgery defined surgical site infection in 1992 to prevent infections and for the first time, based on the recommendation of the Centers for Disease Control,

The term “wound infection” “surgical field” was changed to “infection” (Yıldırım 2015).

Surgical site infection according to the CDC, Within 30 or 90 days of surgery, within 1 year if an implant is used (the first day is counted as the day of surgery) is defined as infection occurring at the surgical site (Klevens *et al.* 2007). Episiotomy, suture abscesses, infected burn areas and circumcision wounds do not fall under the definition of surgical site infections. Resistant microorganisms, the elderly, the increased number of patients, chronically ill and immunocompromised patients, the increased number of patients, and the frequency of surgeries and organ transplants for these patients increases are the factors that increase the incidence of SSI. In addition, non-compliance with sterilization technique, poor surgical technique, and uncontrolled use of antibiotics (Marul and Aygin 2016).

2.4 Infections at the surgical site

Surgical site infections occur as a result of surgical treatment that arises and includes tissue organs or spaces associated with the surgical field. The development of field infections depends on three main factors. These, Bacterial factors, host factors, and local tissue factors (Yıldırım 2015).

2.4.1 Bacterial agents

The type and number of bacteria are important in the onset of infection. Surgical field Infection with pathogenic microorganisms is more than 100,000 per gram of tissue resulting from excessive contamination. Foreign materials in the field of surgery If microorganisms are present, infection may develop with fewer microorganisms as large amounts of bacteria are transmitted through the incision, and SAE occurs in almost all times due to contamination during the operation. Most of them are Gram-positive as the patient’s internal flora, along with the microorganisms, is a factor in the formation of SAE (Yıldırım 2015).

2.4.2 Host factors

During the process of infection development, the host employs two key defense mechanisms in order to fight off the invader. To begin, there is no risk of tissue contamination since the immune responses are only limited in certain areas. The second complication is damage to the tissues that occurs after the illness has already spread. According to Chaplin (2010), they are an essential component of the clearing process and act as a layer of security for the system (Chaplin 2010).

Because of its chronic illnesses, low albumin level, malnutrition, and blood sugar levels that are not within normal limits, its immune system has been compromised, and as a result, it is more prone to infection. The Astonishing Effects of Hypoxia People whose immune systems are compromised due to conditions such as these are more likely to get infections. According to the implication of the article, getting a blood transfusion will have a detrimental impact on a person's immune system. The response of the immune system may be suppressed by a number of factors, including burns, the postoperative period, trauma, chemotherapy, steroids, or immunosuppressive medicines (Nassar *et al.* 2015).

2.4.3 Local tissue factors

Local tissue factors are an important factor in the occurrence of infection. Local tissues fewer than 100,000 disease-causing microorganisms are infected with virulence may be sufficient for development. Sometimes local tissue factors and systemic defense. It can play an active role in disrupting factors. Under normal circumstances it contains a traumatic wound, necrotic tissue and a foreign body that can heal infection may cause ischemia and low PO2 in the tissues while providing a suitable living environment for microorganisms that bleed into that area or blood clots create a favorable environment for the growth of microorganisms (Streilein 1993).

2.4.4 Determine the surgical site infections

Surgical site infections are divided into three, these are, superficial surgical surgery site infections, deep surgical site infections, and surgical site infections (Yıldırım 2015).

2.4.4.1 Superficial infection at the site of ovarian surgery

It develops within 30 days after the operation. Only with skin and subcutaneous tissue and related infections. There are two types of superficial surgical site infection these:

- Primary superficial minimally invasive excision, surgery with one or more incisions are the superficial surgical site infection observed in the primary fissure in an affected patient (such as sternotomy in coronary artery bypass grafts).
- Surgical site infection superficial secondary incision is a surgical procedure with multiple incisions. In the patient, surgical SSIs were observed in the secondary incision (coronary artery bypass such as the saphenous slit in graft operations) (Yıldırım 2015).

2.4.4.2 Deep incisional surgical site infection

These are infections that are observed 30 or 90 days after the surgical intervention and involve the deep tissues of the operation area. There are two types of deep incisional surgical site ınfection these:

- Primary deep-incisional surgical site infections are deep-incisional SSIs observed in the primary incision after surgery with one or more incisions (such as sternum incision in coronary artery bypass graft surgeries) (Yıldırım 2015).
- Secondary deep incisional SSIs are deep incisional SSIs observed in the secondary incision of a patient who was operated with more than one incision (such as donor site saphenous incision in coronary artery bypass graft surgeries) (Yıldırım 2015).

2.4.4.3 Organ/space surgical site infection

Depending on the type of surgery, skin incision, fascia or it is defined as infections involving body parts other than the muscle layer (Yıldırım 2015) as Figure 2.1 and Table 2.1.

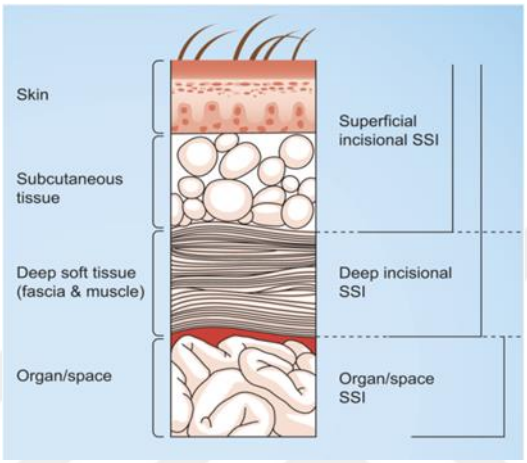

Figure 2.1 Classification of Surgical Site Infections by Depth (Chopra *et al.* 2010)

Table 2.1 Identification criteria for surgical site infections (CDC 2021)

SSI	CRITERIA
Superficial	- infection, Occur up to 30 days after surgery. Incision skin and related to subcutaneous tissue. - At least one of the following items must be present: - Purulent drainage from the superficial fissure. - In tissue culture or fluid (drainage) obtained aseptically from a superficial incision the growth of microorganisms, - at least one of the signs and symptoms of infection, pain or tenderness, localized swelling, redness, or heat and surgeon reopening the incision (negative culture if this criterion is not met), - Superficial infection of the surgical site by the surgeon or attending physician is the diagnosis. - Suturing abscesses, circumcision site infections and infected burn wounds such as SSI are not acceptable
Deep Incisional	- Infection occurs up to 30 or 90 days after surgery. The deep fascia of the incision contains the muscle layers. At least one of the following must be present: - Purulent discharge from a deep incision. - Deep incision by self-separation or by the next surgeon / doctor - Deep incision opening and signs and symptoms of infection in a planned manner - Someone having localized pain or tenderness, fever (>38°C) (if culture is negative) - Abscess involving deep fissure or other signs of infection on direct examination, during invasive procedure, histopathological examination or imaging. - Diagnostic criteria for the relevant surgeon have been removed from the updated guidelines.
Body/Part	- Infection occurs up to 30 or 90 days after surgery. - Infections are opened during surgery except for incisions in the skin, fascia, muscle layer, or injuries involving any part of the body that has been manipulated. - At least one of the following items must be present: - The presence of purulent drainage from the drainage placed in the organ or cavity, - In culture, fluid or tissue is taken aseptically from an organ or cavity - growth of microorganisms, - Direct examination for abscess or other signs of infection, invasive procedure for identification during histological or radiological examination. - Fulfillment of one of the criteria for the sites of injury to members - - Removal of relevant surgeon's diagnostic criteria from updated guidelines.

2.5 The traditional classification of surgical wounds

Wound infection for many years, bacterial contamination during surgery contamination) on the basis of, Clean, tainted clean, tainted and tainted dirty it is divided into four categories (Yıldırım 2015).

2.5.1 The first class - cleaning wounds

Planned surgeries and uncomplicated, acute and primary infections closed wounds are called clean wounds. Primarily in optional conditions cases that are closed and do not have bruising or infection and aseptic technique is not compromised can be an example of clean wounds (Yıldırım 2015).

2.5.2 Class II - clean, contaminated wounds

Clean wounds under non-elective conditions or in a controlled manner. Entry into body cavities colonized by microorganisms, within seven days. Clean wounds that have reopened are clean, contaminated wounds. An example of this group is the controlled respiratory, digestive, or urogenital systems (cholecystectomy or hysterectomy) and minimally invasive aseptic technique. There may be cases where there is no contamination despite malfunctions (Yıldırım 2015).

2.5.3 Category III - infected wounds

Acute non-suppurative infections, significant disturbances in sterilization technique, wounds in which the contents of hollow organs are oozing and perforating for no longer than four hours fall into this category. For example, in open trauma injuries. With serious leaks from the gastrointestinal tract (gastrectomy, colectomy, infected bile in the presence of cholecystectomy) and in cases where there are significant disturbances in sterilization technique can be counted (Yıldırım 2015).

2.5.4 Category IV - infected wounds

Infections that have been present for more than four hours, purulent exudates or abscesses, microbial colonization of the body, non-surgical penetration of cavities, and other similar conditions are all considered to come within the purview of this area. In the case of a traumatic incision, for example, the presence of foreign necrotic tissue

might indicate contamination with feces or other body fluids, organ puncture, or an immediate purulent bacterial infection. According to Yıldırım (2015), it is not uncommon for infection-causing bacteria to be present in the field postoperatively for these wounds (Yıldırım 2015).

As surgical wounds go from being clean to unclean, the amount of bacteria present and the diversity of germs that cause infection both increase. According to the results of the NNIS and when compared to the findings of other study, the infection rate for clean surgical wounds ranges from 1% to 3%, while the infection rate for clean wounds that have been contaminated ranges from 3% to 10%, contaminated wounds range from 5% to 15%, and contaminated wounds that have been infected ranges from 25% to 30%. According to Whitehouse *et al.* (2002), the percentage of people who get an infection from unclean wounds may become as high as forty percent (Whitehouse *et al.* 2002).

2.6 Risk factors of SSI

The chance of developing an infection at a particular surgical site may be influenced by a wide range of different factors. Included among the categories of risk factors that may increase a person's likelihood of qualifying for SSI are the ones that were just discussed (WHO 2018, Seltzer *et al.* 2012).

2.6.1 Intrinsic factors

The previous research has uncovered a good deal of the essential constituents, particularly their distribution. Whitehouse *et al.* (2002), found a number of risk factors, including age, food, cigarette use, extended hospitalization, hypothermia, and underlying medical disorders (Whitehouse *et al.* 2002).

2.6.2 Age

According to Uzunkoy (2005), individuals who are older than 50 years old or less than one year old have a much higher risk of SSI. When compared to patients aged 1-50, persons in this age group had a four times increased risk of developing SSIs as a result of surgery. A value that is three times as high is suggested by the evidence (Bozfakiolu 2001). According to Aga *et al.* (2015), patients who were older than 60 years old accounted for more than half of all SSI cases that occurred following abdominal surgery. This accounted for fifty percent of all people receiving SSI. Patients who were older than 65 years old had a considerably higher risk of experiencing a major SSI after CABG, according to the findings of research conducted by Pan *et al.* (2018). (Pan *et al.* 2018) This was in contrast with individuals who were younger than 65 years old (Pan *et al.* 2018).

2.6.3 Nutritional status

Malnutrition has been linked, for a significant amount of time, to an increased risk of nosocomial infections such as SSI. Patients who have insufficient nutrition have an immune response to infection that is determined to be less competent. This is something that has been discovered. Ascorbic acid is an essential vitamin for the hydroxylation of the amino acids praline and lysine into connective tissue, which is crucial for the healing of wounds, as stated by Seibert (1999) and Haridas and Malangoni (2008). Obesity, which is defined as having a body mass index of 40 or more, has been proven to increase the risk of SSI, especially after implant surgery for the heart or the bones (Bough *et al.* 2007). Obesity is defined as having a body mass index of 40 or more (Bough *et al.* 2007).

Imai and his colleague found that patients who had underweight colon surgery and had a BMI of 25 or above had a 1.67-fold greater risk for SSI when compared with patients who had a BMI of less than 25. This finding was based on the observation that patients who had a BMI of less than 25 had a lower risk for SSI. According to the results of Kang *et al.* (2018), patients who had lost more than five percent of their body weight

before to surgery for head and neck cancer were more likely to develop surgical site infections (SSI) after the treatment. This was shown to be the case when comparing patients who had undergone surgery for head and neck cancer. According to research that was carried out at the Johns Hopkins Hospital, out of 132 patients, it was discovered that 10 patients (7.6%) who had lost more than 4.5 kg of weight preoperatively were found to have had SSI following abdominal surgery (Ejaz *et al.* 2017). This information was found in accordance with the findings of the study (Ejaz *et al.* 2017).

According to the findings of Ri, Aikou and Seto (2018), obesity may lead to a decrease in the oxygenation of tissues as well as a delay in the healing of wounds. A patient's body mass index (BMI) of 30.08.5 kg/m2 was a risk factor for SSI, as shown by the results of a study (Wathen *et al.* 2016) (odds ratio = 1.03, 95% confidence interval: 1.01, 1.04, p =.001). (Wathen *et al.* 2016) conducted research in the area of neurosurgery and discovered that patients with SSI had a higher BMI than those with a BMI of less than 30 kg/m2 (p =.001). When compared to individuals whose body mass index (BMI) was less than 26.0 kg/m2, those whose BMI was more than 26.0 kg/m2 had about two times the risk of significant subarachnoid hemorrhage (OR = 1.58, 95% CI: 1.09, 3.27, p =.03). The investigation was carried out at a teaching hospital located in the Xinjiang region of China. According to the findings of the same study conducted by Ma *et al.* (2018), 70.5% of patients with deep SSI (12 of 17) had a higher BMI (> 26.0 kg/m2) compared to patients who did not have deep SSI (Wathen *et al.* 2016)

2.6.4 Cigarette smoking

Smoking cigarettes is connected with reduced wound healing and decreased blood circulation to the skin. This is because microvascular blockage is induced by platelet aggregation, which in turn is caused by higher levels of hemoglobin that is dysfunctional. According to Scolaro *et al.* (2014), smoking affects the amount of blood that flows to the skin, which in turn inhibits the body's natural capacity to repair wounds (Scolaro *et al.* 2014).

Scolaro and colleagues (2014) discovered that smoking cigarettes reduced the amount of blood flow to the surgical site of a fracture, which in turn reduced the amount of tissue oxygenation. This led to an increased frequency of postoperative infections at the fracture surgical site. According to Scolaro *et al.* (2014), smokers may need longer periods of time for wound healing after surgical treatment for an acute fracture or an open fracture than nonsmokers.

According to the findings of Lin *et al.* (2018), individuals who have a history of smoking are at an increased risk of developing surgical site infections (SSIs) after tibial plateau fracture surgery. Patients who smoked more than 30 packs per year had a significantly increased risk of developing a surgical site infection after major head and neck cancer surgery, according to research carried out by Son *et al.* (2018) at a tertiary referral hospital in South Korea. Patients who smoked more than 30 packs in a year had a worse survival rate. According to Son *et al.* (2018), patients who have a history of smoking more than 30 packs per year had a greater chance of having a surgical site infection after major head and neck cancer surgery (Son *et al.* 2018).

2.7 Precautions to be taken in the preoperative period

As pre-operative measures, measures such as blood sugar and fever control, cleaning with antiseptic and hair cleaning should be taken. In the following section, these measures and their importance are mentioned.

2.7.1 Control of blood sugar

People who have diabetes advocate for blood glucose level control and the avoidance of hyperglycemia, as indicated in guidelines issued by the Centers for Disease Control and avoidance in 1999. People with diabetes advocate for blood glucose level management and the avoidance of hyperglycemia. Blood glucose levels below 200 g/dl are recommended for both diabetics and those who do not have diabetes in the guidelines that were established in recent years (Sabah Al Khair 2014, Kalkan 2017). It is strongly

suggested that patients avoid developing preoperative hyperglycemia (Ricciardi *et al.* 2014). Patients who have diabetes should stay away from According to Dronge *et al.*'s (2006) research, it is recommended that patients get their HgA1c levels down to less than 7% before undergoing Category I surgery. A heart that has been surgically repaired patients who are scheduled to have surgery should have a glucose level that is lower than 180 mg/dL during the first 24 hours after the anaesthetic has worn off (SHEA/IDSA, 2014).

2.7.2 Normal temperature before surgery

The most recent guidelines indicate that a healthy human body temperature is at least 36 degrees Fahrenheit higher than the average. Patients going into surgery who have temperatures that are lower than 35.5 degrees Celsius (the usual temperature) should have a vigilant eye kept on them (Class I) (SHEA/IDSA 2014, Bashaw 2016). Even in the presence of hypothermia, there is a possibility of an increase in the frequency of SSI. A decrease in core body temperature causes subcutaneous vasoconstriction, which in turn inhibits the activity of neutrophils. Both of these effects are a feedback loop. Following this, hypoxia develops in the tissues. The damage is made worse by the low temperature. Blood must be transfused into the patient because it encourages the formation of hematomas. All of these different factors have an impact on the frequency of SSI cases. His voice loudness raises. You may want to do some further research on this topic. It is possible that reducing the number of CAEs that occur before to and during surgery will assist to decrease the amount of blood that is lost. It has been determined that warming up patients is beneficial to them (Melling *et al.* 2001, Wong *et al,.* 2007).

2.7.3 Shower with an antiseptic before surgery

The use of a microbial disinfectant bath before to surgery seems to reduce colonization. Despite this, research has not been successful in identifying SSI. According to SHEA/IDSA (2014) and Bashaw (2016), there is not enough evidence to draw the conclusion that it prevents the sickness from occurring again. It has been proven in

certain studies that washing with 4% chlorhexidine gluconate before to surgery is more successful in reducing the development of surgical site infections (SAE) than using soap or not bathing at all. This is in comparison to not bathing at all. However, conclusive evidence that antiseptic washing before to surgery is beneficial for reducing the occurrence of CAE cannot be found (Webster and Osborne 2015).

2.7.4 Hair cleaning

It has been noted that removing hair from the operation site is a typical preoperative routine (Tanner and Melen 2021, Harrop *et al.* 2012). This has been cited as one of the reasons for this observation. Before making an incision, placing sutures, or applying a dressing, it is common known that the patient's hair has to be removed. In addition to not adequately washing the hair of the skin and preparing the skin, it is likely that the hair itself increases the risk of developing SSI (Marul and Aygin 2016, Tanner 2012).

It is not required to brush one's hair before to surgery since doing so might spread an infection of the ear drum. Tanner (2012) and Marul and Aygin (2016) cite studies that says it is possible to do this, but other research suggests that it is not a good idea to comb your hair (Marul and Aygin 2016, Tanner 2012)

The major source of SAE is the patient's own skin explant that was used in the procedure. Scrubbing the Face and Body People who are not doing very well have a harder difficulty fighting against the invasion of microorganisms into their systems. After the hairs have been inserted, they may be removed using a razor, an electric shaver, or villi. You might do this by making use of a depilatory lotion. removing excess hair from one's head with a razor When washing, there is a possibility that tiny damage may be caused to the skin. It has been postulated that chronic active eczema (CAE) is brought on by the colonization of microorganisms that get access via the tiny holes. Because electric shavers have the potential to produce tiny cuts and scrapes, it is critical to ensure that the bristles are clean before each usage (Baker 2006).

If the lack of hair in the surgical region might potentially cause issues during the surgery, it is strongly recommended to refrain from combing the hair in that area. According to SHEA/IDSA (2014) and Bashaw (2016), there is not a statistically significant difference between patients whose hair is cleaned with a razor (Class II) and those whose hair is not cleaned with a razor (Class I). Several pieces of research on this subject have been analyzed here. In addition, razors were used in the same experiment that was being conducted. Patients who had ETM had a higher chance of developing SSI compared to patients who did not have ETM. In his CAE research, participants were divided into two groups: those who used depilatory creams and those who used razors. According to the findings of Tanner and Melen (2021), there was not a statistically significant difference in the incidence of the disease between the two groups (Tanner and Mellen 2021).

Hair maintenance, if required, should be conducted outside of the operating room. This includes the use of depilatory cream, which is also known as hair removal cream. According to SHEA/IDSA (2014) and Bashaw (2016), it is not recommended to use razors anywhere else than on the scalp and the scrotum. Association of Surgical and Operating Room Nurses (SHEA/IDSA, 2014, Bashaw, 2016). Those working at the Centers for Disease Control and Prevention, in addition to registered nurses. Before you go in for surgery, you really must give your hair a good combing if you want it to appear its very best. The Centers for Disease Control and Prevention (CDC) recommends the following measures to be taken in order to prevent SAEs: (Tanner and Melen, 2021).

- Showering of patients with antiseptic solution the night before surgery (Category IB).
- Rough cleaning of the surgical site and its surroundings, careful washing and cleaning, and then preparing the skin with antiseptic (Category IB).
- Not cleaning the hair unless it creates an obstacle for the surgery, using ETM or hair removal cream if it is thought to create an obstacle, not using a razor (Category IA).
- If a drain is to be placed, it is recommended that the preparation includes the drain site (Category II) (Ducel *et al.* 2002, CDC 2021)

2.8 SSI Prevention

The risk of developing an SSI in the aftermath of surgery varies greatly across individuals. According to Nichols and Florman (2001), health care practitioners, particularly nurses, have the potential to reduce, control, or manage a number of risk factors associated with SSI. Pre- and post-operative nurses place a high premium on infection prevention and control. According to Fry and Fry (2007), evidence-based practice, which is used by pre- and post-operative nurses, lowers the prevalence of surgical site infections (SSI) (Fry and Fry 2007).

2.8.1 Pre-operative SSI prevention

A remedy for the condition of the skin. According to the Fry and Fry (2007), the amount of bacterial colonies that may be found at an incision site can be decreased by performing adequate preoperative cleaning, including the removal of hair and the use of antimicrobial skin preparation. The prevention of surgical site infections (SSI) requires preoperative skin preparation. Before surgery, the surgeon will clean, antisepticize, shave, and depilate the patient's skin (Nichols and Florman 2001). In order to get the patient's skin ready for surgery, antiseptics such as alcohol are utilized (Nichols and Florman 2001).

Seal and Paul-Cheadle (2014) found that there was a way to prevent SSI that was both risk-free and effective. There are many different kinds of skin antiseptics available for your selection. Iodophors, chlorhexidine gluconate, parachlorometaxylenol, iodine, and alcohol are all components that are used. It is usual procedure to take a preoperative antiseptic bath or shower in order to reduce the risk of infection at the surgical site. It is possible that taking a shower with antibacterial soap or detergent might help reduce the amount of skin germs. Both Anderson *et al.* (2008) and Nichols and Florman (2001) discovered that using chlorhexidine showers instead of bar soap significantly decreased the prevalence of Staphylococcus aureus infections in clean operations by fifty percent (Anderson *et al.* 2008, Nichols and Florman 2001).

Shaving the operating region the night before surgery was observed to increase the incidence of surgical site infection (SSI) as compared to the use of depilatory products, clippers, or no hair removal at all by Mangram *et al.* (1999). According to Nichols and Florman (2001), using clippers or depilatory treatments rather than shaving is a more effective way to prevent the spread of infection after surgical procedures. Shaving may result in tiny cuts, which can increase the risk of surgery site infections (SSI) in surgical patients. Before undergoing surgical operations, elective hair removal using an electric clipper is suggested (Odom-Forren 2006). This is due to the fact that depilatory products have the potential to trigger hypersensitivity. In a study that was carried out by Celik and Kara (2007), the researchers found that the risk of SSI was 25% greater in the group that had shaved (n = 371) compared to the group that had not shaved (n = 418) (Celik and Kara 2007)

The prevention and treatment of the disease. The individuals who are about to undergo surgery always have their immune systems examined. Patients undergoing surgical operations who have anomalies in specific aspects of their immune systems may be at a greater risk of complications. Infectious infections have a greater chance of spreading among individuals whose immune systems have been suppressed or compromised in some way (Neil 2007).

Diseases like systemic lupus, leukemia, and lymphoma are a few examples of conditions that may weaken the immune system. According to O'Doherty *et al.* (2009), immunosuppression may be caused by a wide variety of factors, including HIV, chemotherapy, steroids, and metabolic illnesses such as renal failure and diabetes (O'Doherty *et al.* 2009).

The resistance to infection and surgery may be lowered by a number of illnesses as well as drugs. As a consequence of this, nurses are required to have knowledge of both the patient's immune system and the nursing process in order to ensure the patient's safety before to and during surgical procedures (Neil 2007).

Depending on the underlying reason of immunosuppression, infections may either be avoided or treated in a manner that is distinct from one another. When the levels of glucose in the blood are maintained at 110 mg/dl, white blood cells (WBC) are able to operate more regularly, and SSI may be avoided (Odom-Forren, 2006). Immunocompromised individuals have an increased likelihood of contracting an infection. Intravenous immunoglobulin treatment, maintaining great hygiene, avoiding food and water that has not been thoroughly prepared, drinking purified water, and avoiding other people who are sick are all ways that a patient may reduce their risk of developing the condition. When preparing patients for surgery, nurses should make sure that their patients' body temperatures are stable, that their hydration levels are at an appropriate level, and that any risks connected with latex allergies or chemical exposures have been avoided. This is in addition to lowering the risk of opportunistic infections (Neil 2007).

Ensuring that one's nutritional needs are met. Better results were associated with healthier eating patterns before surgery. Both an undernourished state and an overnourished one were contributors to pre-operative problems. According to studies carried out by Gunningberg *et al.* (2008), patients residing in healthcare facilities and nursing homes continue to experience weight loss and undereat. Patients who were at risk were malnourished and had body mass indices that were low. These people often suffer from a lack of protein in their diets. The failure to retain sufficient protein may result in several adverse effects, including shock, edema, and a decreased capacity to fight infection. Last but not least, there is an increased risk of infection. People who are malnourished yet eat well-rounded meals (including carbohydrates, protein, fat, vitamins, and minerals) may be able to prevent themselves from developing SSI (Pear and Williams 2009, Ward *et al.* 2003). Senkal *et al.* (1999) conducted a study that was designed to be prospective, randomized, and controlled. They discovered that consuming an enriched meal before to surgery reduced SSI (Senkal *et al.* 1999).

During surgical procedures, obese people have a greater chance of acquiring a surgical site infection (SSI). Obesity has been related to a number of health problems, including strain on the heart and lungs, pulmonary difficulties, infections, and a slower recovery

time after surgery. According to Bough *et al.*'s (2007) research, obesity is connected to preexisting conditions such as hypertension and diabetes. Patients who are already at a healthy weight but are overweight cannot undergo quick weight loss for safety reasons. If you can do it, switch to a diet that's lower in calories but higher in nutrients. You should not starve yourself or consume a diet heavy in fat (Pear and Williamson, 2009). Patients who are healthy enough to undergo surgery should give some thought to the diets they follow. Before undergoing surgery, these patients should cut down on their consumption of carbohydrates while simultaneously increasing their consumption of protein, fat, and water. These vitamins and minerals accelerate the body's natural recovery process while also lowering the risk of infection and other problems (Bastien *et al.* 2003, Y *et al.* 2007).

It is important for nurses and students who are interested in working in surgical domains to be aware with the need that surgical patients undergo continual nutritional evaluation and adjustment. According to Aydin and Karaoz (2008), it is the duty of nurses to do routine checks for signs of malnutrition in their patients. According to the 1999 CDC Guidelines (Mangram *et al.* 1999, Weber *et al.* 2009), antibiotics administered intravenously 30–60 minutes before surgery should have bactericidal action during intra-operative contamination. This recommendation was made by the authors of both studies. Antimicrobial prophylaxis is one way to reduce the likelihood of a surgical site infection (SSI). It is essential that the correct prophylactic antibiotic be supplied before to the surgical operation. This will ensure that antibiotic blood concentrations remain at an ideal level throughout the surgical process. Forty to sixty percent of surgical site infections (SSIs) may have been prevented by using antibiotics prophylactically. Before surgery, nurses are obligated to provide a crucial prophylactic antibiotic. This is done in order to prevent infection (Nichols and Florman 2001, Odom-Forren 2006).

2.8.2 Post-op SSI prevention

Aseptic surgical wound treatment: Nurses must grasp typical wound healing physiology, washing solution, aseptic procedure, and equipment to treat surgical wounds. Nurses can prevent wound infection by providing proper wound care. Wound

care aims to (1) protect the wound from damage or bacteria, (2) promote wound healing, and (3) limit the transmission of organisms from an infected wound to other areas (Blunt 2011, Vuolo 2006).

The size, site depth, and presence of slough or infection should determine the dressing materials. Dressing absorbs exudates yet keeps the wound surface warm and wet to promote healing and allows gaseous exchange. The predominantly closed incision (i.e., the skin margins are re-approximated at the conclusion of the procedure) should be covered with a sterile dressing for 24-48 hours until it is scaled (Mangram *et al.* 1999). Aseptically apply sterile moist gauze and a dressing to a subsequent surgical wound (Vuolo 2006).

Wound dressing procedures are as follows: (1) whenever a wound is inspected or the dressing is touched, fully aseptic precautions must be taken and the condition of the wound should be recorded by the nurses, (2) equipment and dressing materials must be sterile (3) antiseptic solutions must be freshly prepared (4) the room should be free of visitors, cleaning activities and bed making should cease 30-60 minutes, and (5) separate infected from non-infected cases (Mangram *et al.* 1999, Leaper *et al.* 2008)

SSI wound monitoring: Wound patients need a precise SSI evaluation. SSI evaluation informs care strategy, treatment, and management. Nursing care strategies depended on wound assessment (Baranoski and Ayello 2004). Surgical wound assessment is needed to (1) identify causes of the wound, (2) recognize clear picture of the wound, (3) understand comprehensive picture of the patient, (4) identify contributing risk factors of wound healing, (5) be able to communicate to other health care providers, (6) provide continuity of care, (7) determine centralized location for wound care information, and (8) propose components of the wound care pla (Baranoski and Ayello 2004).

Clinical wound evaluation includes exudates, purulent discharge, size, and SSI measurement. Measurement offered objective data that helped nurses track wound healing progress, detect worsening, improve communication between healthcare professionals, and choose advanced treatment methods (Romanelli *et al.* 2008). SSI

examination begins with incisional site opening. Since SSI is dynamic, systematic, timely evaluation is needed (Romanelli *et al.* 2008).

ASEPSIS helps evaluate SSI: Seven wound criteria for SSI evaluation are ASEPSIS. Additional treatment, serous exudates, erythema, purulent exudates, deep tissue separation, bacteria isolation, and hospital stay beyond 14 days are these characteristics. Summed score over wound evaluation conducted daily for the first five post-operative days reflects infection or complication severity (Romanelli *et al.* 2008).

Nutritional assistance: Post-operative diet treatment aims to maintain weight reduction as quickly as feasible. Energy, protein, and ascorbic acid speed wound healing (Black 2005). Major surgery dramatically increases energy and protein needs. Vitamins and minerals help wound healing too. Limiting protein and fat losses requires adequate energy and protein intakes (Romanelli *et al.* 2008).

Liquid, semisolid, soft, or normal post-operative diets must be rich in calories, protein, vitamins, minerals, and fluids (Appelboam and Sair 2006). Arginine, glutamine, nucleotides, and omega-3 fatty acids prevent surgical complications. Immune-enhancing meals minimize hospitalization and infection consequences. Inadequate dietary support increases morbidity and mortality, delays tissue regeneration, and delays bodily function (Gianotti 2006).

Dietitians should plan pre- and post-surgery meals for surgical patients to boost immune function and prevent SSI. Malnourished patients who received post-operative supplemented diets had fewer SSIs and shorter hospital stays than the control group (Braga *et al.* 2012).

2.9 SSI prevention knowledge and practice

Many things affect behavior. Nurses prevent SSI in surgical patients. For this reason, nurses should be trained in cognitive, emotional and psycho-motor sense. Bloom, a

classical educationalist, identified three learning areas. Cognitive, emotional, and psychomotor (practsical skills) domains. His idea guided this investigation. Domain descriptions follow (Birgin 2016).

Cognitive domain abilities include recalling information, organizing ideas, analyzing and synthesizing facts, applying knowledge, selecting problem-solving options, and assessing ideas or actions. Most courses emphasize knowledge acquisition and usage (Lin *et al.* 2019).

Bloom recognized six cognitive stages, from basic to sophisticated. Remembering, understanding, application, analysis, synthesis, and assessment are these stages. These six stages are divided into lower and higher cognition. Higher-level subscales include analysis, synthesis, and evolution, while lower-level subscales include remembering, comprehensive, and application. Learning about the cognitive domain has several benefits. Bloom's taxonomy and knowledge measure intelligence. These talents suggest that the person can discover knowledge and strategies to accomplish actions and build skills. Professional nurses make decisions using cognitive domain, according to Evenns and Donnelly (2006). Skill requires knowledge and judgment (Corriveau *et al.* 2020).

2.10 SSI prevention knowledge and practice in nurses

Patient variables, wound factors, and nurse evidence-based practice interact to prevent SSI (Hollinworth *et al.* 2008). UK nurses executed aseptic technique badly, especially gloving and hand hygiene (Prester 2005).

Small alleged that staff negligently disregarded the hospital's pre-operative hair removal policy. Turky's medical faculty surveyed 129 clinical nurses. This research found that nurses have inadequate handwashing habits. The individuals felt the need to wash their hands, but intense working circumstances, limited resources, and drying and hurting hands after repeated washing prevented them from doing so (Akyol 2007). Nurses were

found to have inadequate wound management and incorrect dressing usage (Hollinworth *et al.* 2008).

Due to their lack of understanding, nurses were unable to assess nutritional status (Aydin and Karaöz 2008). Nurses' research and practice may help minimize hospital-acquired infections (Hawker 1999). Nurses in India have 73% knowledge and 63% practice in infection control. Knowledge and practice correlated well in this research. Nurses had uneven knowledge and behaviors, although they were connected (Vij *et al.* 2011).

In another Maldives research, nurses showed good knowledge but poor practice scores. Nurses' knowledge and behaviors were also negatively correlated (Najeeb and Taneepanichsakul 2008).

2.11 Iraqi nurses' SSI prevention knowledge and practice

After foreign employees departed Iraq, the nurse-to-population ratio plummeted. Physicians have few nurses. Few nurses meet minimum professional qualifications in many nations. Three Iraqi colleges have outstanding nursing programs, however they are not connected to other institutions or hospitals. Military nurses, now incorporated into public medical care, have higher technical skills than civilian nurses. Iraq needs fresh, well-trained nurses to improve basic care and health education. Community health and nursing administration programmers are needed. The WHO has funded nursing leader training centers and short courses. Three nurse entrance levels replaced six. Nursing pay have risen after the 2003 invasion. These are promising steps, but Iraqi nursing needs more (Garfield and McCarthy 2005).

SSI is growing among surgical and accident patients in Iraqi hospitals. Nurses care for surgery patients pre- and post-op. Nurses give shaving, prophylactic antibiotics, and other pre-operative care based on researcher attendance. Nurses also offer wound evaluation, dressing, and nutritional assistance as required by surgeons. Today, there are

no established SSI preventive nursing recommendations. The nurse-patient ratio is 1:15, compared to the worldwide benchmark of 1:4. Thus, poor nurse-patient ratios would lower nursing quality (Garfield and McCarthy 2005).

SSI prevention requires nurses' evidence-based expertise. Most Iraqi nurses earned Diploma and Bachelor degrees, which did not emphasize SSI prevention. Most nurses learnt infection prevention in general for such curriculums. Today, government-sponsored infection control training programs do not address SSI prevention. Iraq lacks SSI prevention research. Thus, researcher recognizes the necessity to assess Iraqi nursing student knowledge and practice of SSI prevention (Garfield and McCarthy 2005).

2.12 Iraqi hospital surgical site ınfection prevention

In a study of nurses in governmental hospitals in Wasit city, Iraq, 58.3% had poor knowledge of SSI (7.68 ±7.441) and 75.6% had poor practice (36.89 ±13.55). Nurse knowledge and practice are positively linked ($r = 0.216$, $p = 0.000$). at Wasit city, surgical nurses at government institutions (both teaching and non-teaching) have poor SSI preventive knowledge and practices. Preventing SSI was highly connected with maleness and high education. SSI preventative actions were substantially related with serving 1–5 years (Hassan and Masror-Roudsary 2023)

In another study of Baghdad cardiac centers and hospitals, 42% of nurses had 1–5 years of experience, 66% had 1–5 years of cardiac care unit experience, and most had moderate knowledge of surgical site infection prevention (Naji *et al.* 2020).

2.13 Nursing practices

Evidence-based nursing (EBN) in settings of care where resources are obtained, Nursing specialties, clinical preferences and patient preferences are defined as the best available evidence using the decision process. The terms evidence-based nursing and the use of

research in nursing are often used interchangeably (Ayhan 2015). However, with evidence-based nursing the use of research in nursing is not the same because EBN research has a much broader meaning than its use (Ciliska *et al.* 2001).

Evidence-based practice is an issue that nurses care about as well as many professional groups. The reason this movement is accelerating is that health professionals and malpractice increases as well as the demands of organizations. Evidence-based health maintenance practices The increase in maintenance cost is only 20% of the care provided. Evidence-based patients' anxiety of experiencing malpractice, due to increased requests for information and decreased trust in health workers. It is important in evidence-based nursing practices, Quality of Patient Care Positively improving and improving patient care outcomes, improving patient care in terms of outcomes such as standardization and increasing nurse satisfaction absolutely necessary (Kocaman 2003, Yılmaz 2005).

About effective and safe care and practices The nurse is expected to be accountable to the community, his team and colleagues. One way to achieve this method is to use evidence-based practice (EBP) (Kocaman 2007, Küçükkaya 2010). Nurses and evidence-based practices are difficult but impossible to put into routine practice (Yilmaz 2005).

3. MATERIAL METHODS

In this section, the type of research, sample, measurement tools and analysis methods used are introduced.

3.1 Participants

A cross-sectional design used to conduct this study, convenience sampling was used to obtain a representative nursing student from Kirkuk university and Al_Kitab National university. In this sample method, the researcher tries to select the units from each part of the heap that he believes represent the heap in the best way. This choice differs from person to person (Büyüköztürk *et al.* 2008).

The sampling processes were divided into population stratification, sample distribution, and stratified cluster sampling. In the population stratification stage, local groups and collage were used as the stratification variable to minimize sampling error.

3.1.1 Sampling criteria and sample size

Study participants were selected based on a specific eligibility criteria, inclusion criteria for participation in this study include

- Ungraduated Nursing students (still study in their universities).
- Volunteer to participate in research
- Being a native Arabic, speak and can read and understand English language in a good way.

The total number of the students in these colleges is 500 student. The sample size was determined as 217 according to the 95% confidence interval and 50% response as below. Although it was intended to reach the entire population sample, a statistical sample calculation was made for study reliability. The research community consists of

500 university students who fit the study criteria. Accordingly, while determining the statistical sample size, p = 0.5, q = 0.5 and d = 0.05, assuming α = 0.05, Equation (3.1).

$$n = \frac{\mathrm{N}t^2\mathrm{pq}}{d^2(\mathrm{N}-1)+t^2\mathrm{pq}} \tag{3.1}$$

N: Universe

n: Frequency of application to be sampled

p: Frequency of the event under investigation

q: Frequency of non-occurrence of the investigated event

t: Theoretical value found from the table t at a certain degree of freedom and detected error level

d: The desired ± deviation according to the incidence of the event, Equation (3.2).

$$n = \frac{(500)(1{,}96)(1{,}96)(0{,}5)(0{,}5)}{(0{,}05)(0{,}05)(500-1)+(1{,}96)(1{,}96)(0{,}5)(0{,}5)} \tag{3.2}$$

with the formula (Trost, 1986) n= 217.4917≈217

A total of 250 questionnaires were distributed, 217 of them were completed. About 33 of participants students were excluded whose did not answer questions about their classes, income satisfaction or answer the questionnaire in incorrect method.

3.2 Data collection tools

In data collection, A set of structured questionnaires were used in this study. The questionnaires were divided into three parts (Appendix 1).

3.2.1 Personal information form

The form includes 6 relationship analysis questions to examine the relationship between nursing students' knowledge and practice with demographic data which included Age, Gender, Marital status, Income satisfaction, University of study and Class (Appendix 1).

3.2.2 Nurses' knowledge scale

The nursing students knowledge scales were assessed by questionnaire was developed by Qasem and Hweidi (2017), this questionnaire consists from 9 questions based on the Centers for disease control and prevention, and SSI prevention guideline (Appendix 1).

The nursing knowledge test questionnaire follows the pattern of multiple-choice questions, where each question followed by four response alternatives: one answer is correct, two distractors, and the sentence “I do not know”, to discourage guessing Cronbach's Alpha 0.80 (Qasem and Hweidi 2017). In this study Cronbach's Alpha 0.77.

3.2.3 Nurses practice

The nursing students practice was assessed by a questionnaire was developed by (Sham *et al.* 2021) includes 25 questions using a 4-point Likert scale ranging from (No Practice = l, Rarely Practice = 2, Sometimes Practice = 3, Always Practice = 4). These 25 questions focus on what the nurse should to do with patient during pre-operative and post-operative period. For pre-operative period, the scopes of contents are hygiene and skin preparation controlling underlying medical conditions, maintaining nutritional status, and antibiotic prophylaxis. For post-operative period, it includes surgical wound

care with aseptic precaution, wound assessment and monitoring of SSI, and nutritional support. (Appendix 1). Cronbach's Alpha 0.92 (Sham *et al.* 2021), In this study Cronbach's Alpha 0.86.

3.3 Data analysis

SSPS version 20.0 was used to evaluate the data. The conformity of the study data to the normal distribution was tested. Compliance with the normal distribution can be examined using the Shapiro-Wilk test. For datasets smaller than 2000 elements, we use the Shapiro-Wilk test, otherwise, the Kolmogorov-Smirnov test is used. In our case, since we have only just 217 elements, the Shapiro-Wilk test was used and showed that the data comes from a non-normal distribution.

The mean of percentage changes or log returns is the simple average. Because of the potentially powerful effects of compounding returns over time, however, the geometric average can provide a more representative statistical characterisation of price change in a typical year (Smith 2012).

The standard deviation (SD) measures the extent of scattering in a set of values, typically compared to the mean value of the set (Whitley and Ball 2002, Wissing and Timm 2012, Vetter 2017). The calculation of the SD depends on whether the dataset is a sample or the entire population. Ideally, studies would obtain data from the entire target population, which defines the population parameter. However, this is rarely possible in medical research, and hence a sample of the population is often used (Vetter 2017).

Cronbach’s Alpha: Many, but not all, of the 2015 volumes of four science education journals (IJSE, JRST, RISE, SE) that cited alpha values provided qualitative interpretations of the significance of the values calculated in relation to what was being measured (which, as discussed above, was usually considered a form of reliability or internal consistency). Some research suggested alpha had a cut-off or threshold. One paper alluded to "the acceptable values of 0.7 or 0.6" (Griethuijsen *et al.* 2014).

3.4 Ethical dimension of the research

The research was approved by the ethical and class issues committee for nursing collage in Kirkuk university and Al_Kitab univirsety, and by the ethics committee of the College of Nursing at the Çankırı Karatekin on September, 28, 2022 (Appendix 2). Each participant was informed about the purpose of the research and signed to give their consent to participate.

4. RESULTS

This section shows the Descriptive statistics of the study sample that match to the study's objectives, which were first stated in chapter one. These outcomes are listed below.

Table 4.1 Distributions of the study sample according to the sociodemographic characteristics

VARIABLES		**ANALYSIS**	
Age	**Mean ± SD**	22.83± 2.86	
	Group	**Frequency**	**Percent**
	18-22	100	46.1
	23-26	95	43.8
	27-30	22	10.1
	Total	217	100.0
Gender	Female	85	39.2
	Male	132	60.8
	Total	217	100.0
Marital status	Single	159	73.3
	Married	58	26.7
	Total	217	100.0
University of study	Kirkuk university	112	51.6
	Alkitab university	105	48.4
	Total	217	100.0
Time of the Study	Morning	113	52.1
	Evening	104	47.9
	Total	217	100.0
Class	Initial stages	85	39.2
	final stages	132	60.8
	Total	217	100.0
Income level	Unsatisfied	88	40.6
	Satisfied	129	59.4
	Total	217	100.0

Initial stages= first and second, final stages= third and fourth.

Table 4.1 represents the descriptive statistics of the sociodemographic information of the nursing students in terms of frequencies and percentages. Out of 217 participated in

study 100 student were aged between 18-22 were recorded the highest percentage (46.1%), while about 22 student were aged between 27-30 (10.1%). Finding participants' gender, male participants predominated (60.8%) as compared with those who were female (39.2%). Marital status-related findings: most participants were single (73.3%) as compared with those who are married (26.7%).

According to the university in which they are still studying, Kirkuk university were record the highest percentage 112 (51.6%). Concerning Study Time, more than half of participants were studaying in Morning (52.1%). About 132 of student in our sample was in the final stages (60.8%). Concerning income, more than half of participants were satisfied with there income (59.4%).

Table 4.2 Assessment of nursing student knowledge about the prevention of surgical site infection (SSI).

Items	Answers			
	True		False	
	F	%	F	%
1.It is recommended to protect a primarily closed incision	146	67.3	71	32.7
2. The appropriate time to shower or bathe with an uncovered incision is	142	65.4	75	34.6
3.Surveillance succeeds in reducing the incidence of SSI (surgical site infection)	115	53.0	102	47.0
4. Elective surgery on patients with remote site infections should be postponed until the infection has resolved.	134	61.8	83	38.2
5. SSIs are classified as . . .	133	61.3	84	38.7
6. Stitch abscesses (minimal inflammation and discharge confined to the points of suture penetration) are classified as SSI.	143	65.9	74	34.1
7. To be classified as SSI, a superficial incisional infection needs to occur	204	94.0	13	6.0
8. If the patient’s hair at or around the incision site interferes with the operation, it is recommended to remove it by	205	94.5	12	5.5
9. The recommended time of preoperative hair removal in elective surgery is	85	39.2	132	60.8

F= Frequency, % = Percentage

In table 4.2, The results showed that the majority (94.5%) of nursing students showed True answer about item "If the patient’s hair at or around the incision site interferes with the operation, it is recommended to remove it by", followed by those who had low True answer about the prevention of surgical site infection om item " The recommended time of preoperative hair removal in elective surgery is " (39.2%).

Table 4.3 Over all assessment of nursing student knowledge about the prevention of surgical site infection (SSI).

	F	%
False answer	19	8.8
True answer	198	91.2
Total	217	100

F= Frequency, % = Percentage, SD= standard deviation

In table 4.3, The results showed that the majority (91.2%) of nursing students showed true answer about the prevention of surgical site infection (SSI), , followed by those who had Fulse answer about the prevention of surgical site infection (8.8%).

Table 4.4 Assessment of nursing student practices about the prevention of surgical site infection (SSI).

No	Items	Answers							
		Never Practice		Seldom Practice		Sometimes Practice		Always Practice	
		F	%	F	%	F	%	F	%
1	Alcohol and Chlorohexidine Gluconate (CHG) are the antimicrobials most used for the patient's skin preparation in my ward	50	23.0	21	9.7	67	30.9	79	36.4
2	I wash my hands before and after changing wound dressing and touching the surgical site	4	1.8	30	13.8	68	31.3	115	53.0
3	I wash my hand before wearing sterile gloves	4	1.8	13	6.0	85	39.2	115	53.0
4	I perform pre-operative shaving right before surgery	14	6.5	18	8.3	80	36.9	105	48.4
5	I administer pre-operative prophylactic antibiotic within one hour before surgery	10	4.6	36	16.6	72	33.2	99	45.6
6	I advise my patient to take pre-operative showering 6 to 12 hours before surgery	16	7.4	44	20.3	74	34.1	83	38.2
7	I advise my patient to take pre-operative showering or bathing with antimicrobial agents	17	7.8	46	21.2	76	35.0	78	35.8

8	I perform prescribed glucose test before and after surgery in a diabetic patient	12	5.5	36	16.6	69	31.8	100	46.1
9	I administer injection insulin or give oral medication as ordered in a diabetic patient	6	2.8	33	15.2	71	32.7	107	49.3
10	I assess my patient's body mass index (BMI) before and after surgery	18	8.3	38	17.5	83	38.2	78	35.9
11	I advise a malnourished patient to has healthy nutritious food intakes (especially protein diet)	8	3.7	28	12.9	73	33.6	108	49.8
12	I advise my patient to take vegetables and fruits before and after surgery	18	8.3	33	15.2	77	35.5	89	41.0
13	I advise my patient with compromised immune system to avoid contact with people with infection	16	7.4	25	11.5	63	29.0	113	52.1
14	I advise obese patients to practice less intake of carbohydrate	17	7.8	33	15.2	71	32.7	96	44.2
15	I use sterilized dressing materials for cleansing surgical wound dressing	15	6.9	24	11.1	74	34.1	104	47.9
16	I use povidone-iodine and normal saline for cleansing surgical wound dressing	12	5.5	27	12.4	77	35.5	101	46.5
17	I use an aseptic technique during surgical wound dressing	8	3.7	36	16.6	71	32.7	102	47.0
18	I learn the shaving method from others and apply it to pre-operative patients	17	7.8	36	16.6	74	34.1	90	41.5
19	I used aseptic technique when obtaining swab culture	16	7.4	23	10.6	78	35.9	100	46.1
20	I advise an immunodeficiency disorder patient to maintain personal hygiene	7	3.2	32	14.7	55	25.3	123	56.7
21	I assess and monitor surgical site condition	11	5.1	23	10.6	70	32.3	113	52.1
22	I separate infected from non-infected cases during dressing	10	4.6	21	9.7	70	32.3	116	53.5
23	I use face mask during cleansing surgical wound dressing	19	8.8	26	12.0	63	29.0	109	50.2
24	I clean and disinfect the surface of the dressing	10	4.6	18	8.3	49	22.6	140	64.5

	trolley with antiseptic solution								
25	I discard the soiled material in the proper place after performing wound dressing	4	1.8	12	5.5	31	14.3	170	78.3

F= Frequency, % = Percentage

In table 4.4, The results showed that the majority (56.7%) of nursing students showed Always Practice answer about item "I advise my patient with compromised immune system to avoid contact with people with infection", followed by those who had low Always Practice answer about the prevention of surgical site infection om item " I advise my patient to take pre-operative showering or bathing with antimicrobial agents " (35.8%).

Table 4.5 Over all Assessment of nursing student practices about the prevention of surgical site infection (SSI)

	F	**%**	**Mean± SD**	**Min**	**Max**
No Practice	0	0	3.23±0.355	2.04	4.00
Modraite Practices	52	24.0			
Good Practices	165	76.0			
Total	217	100.0			

F= Frequency, % = Percentage, SD= standard deviation, [mean of scores (M.S) = 4, cut off point (0.99), No Practices M.S.= 1-1.99, Modraite Practices M.S. = 2 -2.99, good Practices M.S. = 3-4] (Phoong, 2021).

In table 4.5, The results showed that more than two thirds (76%) of nursing students showed good practices about the prevention of surgical site infection, as described by the high average, which is equivalent to 3.23 (SD = 0.355), followed by those who had poor practices about the prevention of surgical site infection (24%). When the data obtained are examined, it can be said that the practice level of the nurses is at a moderate level.

Table 4.6 Statistical knowledge and practices with regards nursing student age

Scale	Grouping Variable			Kruskal-Wallis H	P-Value
	Age	N	Mean±SD		
Knowledge	18-22	100	1.08± 0.272	0.928	0.629
	23-26	95	1.41±0.308		
	27-30	22	1.046±0.213		
	Total	217	1.087±0.283		
Practices	18-22	100	2.72±0.451	1.724	**0.042**
	23-26	95	2.8±0.402		
	27-30	22	2.77±0.44		
	Total	217	2.76±0.427		

N= number of participants, SD= standard deviation, S: Significant at P<=0.05, HS: Highly Significant at P<0.01, p-value: probability value.

The analysis in Table 4.6 showed that there were no statistically significant differences in nursing students' knowledge, but there significant differences in practices about the prevention of surgical site infection with respect to their age. According to the results, individuals between the ages of 23-26, according to the age range of 27-30, It shows that individuals in the 27-30 age range have more practical opportunities than those in the 18-22 age range.

Table 4.7 Statistical knowledge and practices with regards nursing student gender

Scale	Grouping Variable			U	P-value
	Gender	N	Mean±SD		
Knowledge	Female	85	1.12±0.324	5332.50	0.209
	Male	132	1.068±0.253		
Practices	Female	85	2.84±0.373	4919	**0.038**
	Male	132	2.71±0.454		

N= number of participants, SD= standard deviation, U=Mann-Whitney, S: Significant at P<=0.05, HS: Highly Significant at P<0.01, p-value: probability value.

The analysis in Table 4.7 showed that there were no statistically significant differences in nursing students' knowledge about the prevention of surgical site infection with their gender. While there were statistically significant differences in nursing students' practices about the prevention of surgical site infection with their gender. According to

the results, it is seen that female students have the opportunity to practice more than male students.

Table 4.8 Statistical knowledge and practices with regards nursing student marital status

Scale	Grouping Variable			U	P-value
	Marital status	N	Mean±SD		
Knowledge	Single	159	1.069±0.254	4294	0.114
	Married	58	1.14±0.347		
Practices	Single	159	2.761±0.428	4600	0.971
	Married	58	2.758±0.432		

N= number of participants, SD= standard deviation, U=Mann-Whitney, S: Significant at P<=0.05, HS: Highly Significant at P<0.01, p-value: probability value.

The analysis in Table 4.8 showed that there were no statistically significant differences in nursing students' knowledge and practices about the prevention of surgical site infection with their marital status.

Table 4.9 Statistical knowledge and practices with regards university of study

Scale	Grouping Variable			U	P-value
	University of study	N	Mean±SD		
Knowledge	Kirkuk university	112	1.152±0.360	5099.50	**0.001**
	Alkitab university	105	1.019±0.138		
Practices	Kirkuk university	112	2.777±0.418	5680.50	0.559
	Alkitab university	105	2.743±0.439		

N= number of participants, SD= standard deviation, U=Mann-Whitne, S: Significant at P<=0.05, p-value: probability value.

The analysis in Table 4.9 showed that there were statistically significant differences in nursing students' knowledge about the prevention of surgical site infection with respectively to their university of study. According to the results, the knowledge level of Kirkuk University students was found to be higher than the knowledge level of Al Kitap University students.

While there were no statistically significant differences in nursing students' practices about the prevention of surgical site infection with their university of study.

Table 4.10 Statistical knowledge and practices with regards time of the study

Scale	Grouping Variable			U	P-value
	Shift	**N**	**Mean±SD**		
Knowledge	Morning	113	1.080±0.272	5792.50	0.852 NS
	Evening	104	1.096±0.296		
Practices	Morning	113	2.779±0.417	5430	0.334 NS
	Evening	104	2.74±0.441		

N= number of participants, SD= standard deviation, U=Mann-Whitney, S: Significant at P<=0.05, HS: Highly Significant at P<0.01, p-value: probability value.

The analysis in Table 4.10 showed that there were no statistically significant differences in nursing students' knowledge and practices about the prevention of surgical site infection with their time of the study.

Table 4.11 Statistical knowledge and practices with regards class

Scale	Grouping Variable			U	P-value
	Class	**N**	**Mean±SD**		
Knowledge	Initial stages	85	1.06±0.239	5224	0.081 NS
	Final stages	132	1.13±0.337		
Practices	Initial stages	85	2.72±0.452	5216	0.238 NS
	Final stages	132	2.79±0.411		

N= number of participants, SD= standard deviation, U=Mann-Whitney, S: Significant at P<=0.05, HS: Highly Significant at P<0.01, p-value: probability value.

The analysis in Table 4.11 showed that there were no statistically significant differences in nursing students' knowledge and practices about the prevention of surgical site infection with respect to their class.

Table 4.12 Statistical knowledge and practices with regards income level

Scale	Grouping Variable			U	P-value
	Income level	**N**	**Mean±SD**		
Knowledge	Unsatisfied	88	1.14±0.345	5210	**0.036** S
	Satisfied	129	1.05±0.227		
Practices	Unsatisfied	88	2.79±0.405	5341	0.318 NS
	Satisfied	129	2.73±0.442		

N= number of participants, SD= standard deviation, U=Mann-Whitney, S: Significant at P<=0.05, HS: Highly Significant at P<0.01, p-value: probability value.

The analysis in Table 4.12 showed that there were statistically significant differences in nursing students' knowledge about the prevention of surgical site infection with their income level. While there were no statistically significant differences in nursing students' practices about the prevention of surgical site infection with their income level. According to the results, the general knowledge level of the students who are not satisfied with their income level was found to be higher than the students who were satisfied with their income level.

5. DISCUSSION

This study was conducted with the objective of contrasting the strategies that were taught to nursing students at Kirkuk University and Al-Kitab University, both located in Kirkuk, Iraq, with the aim of assest Nusing Students ın the preventıon of surgıcal site ınfectıon ın this part, the results are analyzed in light of the questions that were posed and the hypotheses that were developed.

In this study, the largest number of participants was between the ages of 18-22. This result is consistent with previous studies, according to which the majority of the study sample was between the ages of 20-29 years (Teshager *et al.* 2015, Woldegioris *et al.* 2018,). The majority of the study sample were males. This result agrees with (Brisibe *et al.* 2014, Teshager *et al.* 2015) who find the majority of their study sample were male nurses

The results of this study showed that the majority (91.2%) of the nursing students showed a correct answer about the prevention of surgical site infection (SSI). This study is consistent with a number of previous studies. Which showed that the majority of nurses answered correct answers. A study conducted in Saudi Arabia (Sadia *et al.* 2017) also agrees. Which stated that 61.07% gave correct answers about disinfecting the surgical site. It is also consistent with a study conducted in Ethiopia (Woldegiori *et al.* 2018) which reported that 74.5% of nurses had a good knowledge of SSI prior- tion. It is also consistent with studies conducted in Nigeria Which reported that the majority of the nursing staff had good knowledge about infection prevention at the surgical site (Brisibe *et al.* 2014, Famakinwa et. al., 2014). In addtion this result consist with study in jordan who found the nurse have good knowledge (Qasem and Hweidi 2017).

This finding is in contrast to a study conducted in Ethiopia (Teshager *et al.* 2015) which showed that the percentage of nurses who were knowledgeable about the prevention of surgical site infection. It found 40.7%, with an average score of 56.3%. Exists indicated that more than half of the nurses working in the two referral hospitals showed insufficient knowledge. On the prevention of surgical site infections (El-Enein and El

Mahdy, 2011, Fashafsheh *et al.* 2015). The result of our study also contradicts many similar and related studies in African and Western countries. Likewise, this finding is inconsistent (Famakinwa *et al.* 2014) With a Nigerian study in that only 40% of the participants they had sufficient knowledge about prevention from SSI. These results show that students are conscious about preventing infection before surgery. This outcome is a priority for a successful surgical intervention. It's likely that the similarities in the outcomes of this research are due to the fact that the participants all had comparable jobs. Curriculum in nursing worldwide, with the nursing curriculum in Iraq providing helpful information on infection control at surgical sites and comparable training throughout undergraduate courses.

The results of this study showed that more than two-thirds (76%) of the nursing students showed good practices about the prevention of surgical site infection as described by the high mean, which is equal to 3.23 (SD = 0.355), followed by those who had poor practices about the prevention of surgical site infection (24%). This finding is consistent with a study conducted in Ethiopia (Teshager *et al.* 2015) which revealed that nursing practices in the prevention of surgical site infection were good. When the demographic variables related to the applications are examined, it is seen that the application skills of the individuals in the 23-26 age group are perceived to be higher than the individuals aged 18-22 and 27-30 years. At the same time, women see themselves as more competent than men in terms of practice skills. As the reason for this situation, it can be said that individuals in the age group of 23-26 are faced with professional practices more intensely. Because, while the 18-22 age range is just starting their professional practice, individuals between the ages of 27-30 may have moved away from the practices at the end of school. One of the reasons for this situation may be that nursing is perceived as a female profession and therefore women are more willing to practice (Çınar and Olgun, 2013, Kaya, Turan, and Öztürk, 2011, Kocaer et. al., 2004). Another reason is that women always perceive themselves as more competent than men in terms of practical skills. Because socially, women use hygiene practices, which include the processes of practical applications in surgical interventions, as a reflection of gender roles in the home (Vatandaş, 2007). For this reason, women may show more interest in

practicing opportunities in surgical applications and say that they benefit more from them.

While there is a differentiation in the level of knowledge of the students according to the university of education, there is no difference in perception of the level of practice. While there is no difference between universities in terms of practice, this situation may reflect the difference between the two universities in terms of providing theoretical education. For this reason, it would be useful to examine the theoretical training given by universities in more detail in order to reach a broader judgment on this issue.

In the study, no difference was found in terms of SSI knowledge level and practices according to the grade level, marital status and time they studied. According to these data, marriage does not affect students' working systems. This is understandable. However, it was expected that the knowledge and application levels of the students would differ according to the classes (Ayla, Ozyacıoğlu, Atak and Surenler, 2018). Because senior students are expected to perceive themselves as more competent.

When analyzed according to income level, it is seen that students who are not satisfied with their income level perceive their SSI knowledge level more than students who are satisfied. However, the same difference was not found to be significant in terms of perception of application competencies. This may be due to the motivation of low-income students to improve their skills and improve their financial situation. Because the expectation of financial return is an important motivator for the success of individuals (Chen *et al.* 2018).

6. CONCLUSION

These results show us that the education given at the university should be sufficient in terms of both knowledge and application level. Giving students more practice opportunities, especially in training, improves their nursing skills better. In particular, providing students with equal opportunities according to gender, income level, class differences and socio-economic differences will make education higher quality. In this sense, it is thought that the perception levels of nursing knowledge and practice skills of students in both universities (Kirkuk University and El Kitap University) will improve with more opportunities to be presented.

7. RECOMMENDATIONS

Based on the findings of this study, the researchers suggest the following recommendations:

- Education and training program should be conducted to improve nursing students' knowledge and practice in some areas using evidence-based practice (it may online classes or zoom conferences it could be convenient and economic for training).
- The nursing course in universities should be adjusted to include the prevention of surgical site infection in the contents.
- Similar research should be conducted in other cities and other universities in Iraq and with large sample.
- A replication study using observation method is recommended to examine the level of nursing students practice.

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APPENDICES

APPENDIX 1. Questionnaires

APPENDIX 2. Ethics CommIttee in Çankiri Karatekin Approval

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