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**Emergency Medical Services Providers' Experiences and knowledge Toward
Infection Prevention and Control Measures in Saudi Arabia**

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Emergency Medical Services Providers' Experiences and knowledge Toward Infection Prevention and Control Measures in Saudi Arabia

Abstract

Providers of emergency medical services (EMS) are often exposed to a variety of infectious risks in the prehospital setting. Despite the Occupational Safety and Health Administration's (OSHA) requirements for initial and ongoing training on infectious diseases and universal precautions, the Centers for Disease Control and Prevention's (CDC) clear recommendations on the use of such precautions during patient care, occupational exposures to communicable diseases continue to be a major concern for EMS agencies. **Aim of the study:** This study aims to assess the experience and knowledge of EMS providers towards methods of prevention of infectious diseases and control measures. **Results:** According to demographic results, it was found that The ages of the study sample ranged from 24 to 52 years, with mean ages (41.19), (50.7 %) of the participants are females, and (49.3%) of the participants are males. According to knowledge, the knowledge of EMS providers towards control measures with degree (yes) which means that the high degree of the knowledge of EMS providers towards control measures. According to experience, the results found good experience of EMS providers towards control



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measures. **Conclusion:** Results concluded that good experience and knowledge of EMS providers towards methods of prevention.

Keywords: Emergency Medical Services, Experiences, knowledge, Infection, Prevention, Control.

Introduction

The ability to save lives and lower rates of mortality and morbidity makes emergency medical services one of the most crucial aspects of health care. Since the 1960s, operations research scientists, EMS planners, and healthcare professionals have researched several challenges appearing in the administration of EMS systems. As a result, they have come to understand the necessity and sensitivity of decision making in the Emergency Medical Services (EMS) industry (Aringhieri et al., 2017).

In the hectic, high-volume environment of emergency care, infection control presents a significant issue. The emergency department (ED) is a dynamic and complicated medical setting. Patients who are generally healthy to those who are severely sick appear with undifferentiated diseases and varying levels of acuity. Under severe time and resource limitations, risk assessment and medical decision-making are frequently relied on sparse and changing data. Patients are waiting in close proximity to one another for diagnosis, treatment, and disposal (Liang et al., 2014).



Healthcare systems and organizations must make the prevention of healthcare-associated infections (HAIs) a key priority since they pose a serious threat to the safety of both patients and healthcare workers (HCWs). HAIs impact between 5 and 15 percent of patients and between 9 and 37 percent of patients confined to intensive care units (ICUs). One out of every twenty-five patients in the United States (US) at any one time has a HAI. HAIs can have a negative impact on a person's quality of life, possibly shorten their life span, and result in significant long-term expenditures. As an illustration, the probability of HAIs after a needle-stick injury using a needle from a patient who had hepatitis A or b was 6-30%, 3%, and 0.3%, respectively (Alhumaid et al., 2021).

Providers of emergency medical services (EMS) are often exposed to a variety of infectious risks in the prehospital setting. Despite the Occupational Safety and Health Administration's (OSHA) requirements for initial and ongoing training on infectious diseases and universal precautions, the Centers for Disease Control and Prevention's (CDC) clear recommendations on the use of such precautions during patient care, occupational exposures to communicable diseases continue to be a major concern for EMS agencies (Sayed et al., 2011).

Literature review

Emergency medical services (EMS) are essential to disaster relief efforts, especially pandemic response. It is commonly known that EMS workers serve as the initial responders in biological crisis situations (Al Amiry & Maguire, 2021).



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Emergency medical services (EMS) are a vital aspect of healthcare delivery that have a noteworthy impact on lowering death rates outside of hospitals. Emergency medical services (EMS) workers attend to patients who are in complicated situations and have severe conditions. These patients are exposed to a variety of unforeseen stresses and hazards. As a result, individuals endure elevated stress levels and persistent tension. Research revealed that anxiety, irritability, social isolation, sleep disorders, job dissatisfaction, burnout, workplace incivility, quitting the profession, post-traumatic stress disorder, risk behaviors, psychological issues, depression, and anxiety affect 22% of emergency medical services providers. They are also more likely to make medical errors. Stress among EMS professionals can be caused by a variety of circumstances (Afshari et al., 2021).

Emergency medical services (EMS) staff must have the proper training on personal protective equipment (PPE) in light of the 2019 new coronavirus illness (COVID-19) (Cash et al., 2021).

Significance of the study

Previous studies have shown that EMS providers had a low degree of compliance with preventative measures, with stated misperceptions about dangers and justifications of individual talents. The purpose of this study is to investigate the experiences, knowledge, and motivations of EMS providers as well as their perspectives of conventional infection prevention and control (IPC) (Khan, 2019).



Aim of the study:

This study aims to assess the experience and knowledge of EMS providers towards methods of prevention of infectious diseases and control measures.

Objectives:

- 1) Assess the experience of EMS providers towards prevention of infectious diseases.
- 2) Assess the knowledge of EMS providers towards control measures.

Research Questions:

1. What is the experience of EMS providers towards prevention of infectious diseases?
2. What is the knowledge of EMS providers towards control measures?

Methodology

Overview

In this chapter, the participants of the study and the instruments employed are introduced. Moreover, the procedure of the research, the design and data analysis are presented in detail where This study aims to assess the experience and knowledge of EMS providers towards methods of prevention of infectious diseases and control measures.



Research design:

Descriptive analytic cross sectional study design to discuss experience of EMS providers towards prevention of infectious diseases and to assess knowledge of EMS providers towards control measures.

Participants

Study sample was selected via the systematic random sampling method. We recruited **140** Emergency Medical Services Providers.

Inclusion Criteria:

- (1) Emergency Medical Services Providers.
- (2) female and male.
- (3) from Saudi Arabia.

Exclusion Criteria:

- (1) Non-Saudi Arabian EMS providers.
- (2) Any healthcare personnel other than EMS

Instruments

The study tool consists of two sections as follows.

Demographic Data:

It will concern with Participants personal data as age, gender, address, marital status and educational level.



knowledge assessment Tool:

Ten questions were used to calculate knowledge about infection prevention. If the score was equal to or higher than the mean, EMS providers were considered to have appropriate understanding of infection prevention. Respondents were categorized as having insufficient knowledge of infection prevention if their scores fell below the mean value of correct responses. The main elements of infection prevention measures, such as hand hygiene practices, the use of personal protective equipment (PPE) and post-exposure prophylaxes (PEP), healthcare waste management practices, and instrument disinfection practices, were evaluated in terms of the infection prevention practices of healthcare providers. Respondents were asked to rate how frequently they used each of these seven infection prevention strategies (Assefa et al., 2020).

Experience assessment Tool:

Experience assessment questions had either three or two possible alternative responses (“Always” or “Yes”, “Sometimes” and “Never” or “No”). Each appropriate or proper practice received one point, while all other replies received a score of zero. EMS received a practice score based on their combined experience ratings. As a result, the total score for the Experience questions, which ranged from 0 (all infection prevention measures not practiced safely) to 7 (all infection prevention measures practiced safely), was divided into two categories: good experience (equal to or above the mean) and low experience (below the mean) (Assefa et al., 2020).



The validity of tools:

The validity of the tool means ensuring that it will measure what it was designed to measure. Validity also means the tool's inclusion of all the elements that must be included in the analysis on the one hand, and the clarity of its paragraphs and vocabulary on the other hand, so that it is understandable to everyone who uses it.

The validity of the study tools was confirmed by.

1- Face validity

The revision of the tools will be ascertained by a panel of experts to measure the content validity of the tools and the necessary modification will be done accordingly. Face validity will be by expertise. The modification will be done.

2- Internal consistency validity

The validity of the construct was confirmed by calculating the internal validity of the tool's items, where the correlation coefficient was calculated between the sample's answers to each item and the total score of the questionnaire to which it belongs, and the results were as follows:

Table (1) Pearson correlation coefficient between (1) each item and the total score of the questionnaire

No	Person correlation coefficient	No	Person correlation coefficient
1	.771**	10	.677**
2	.509**	11	.602**



3	.690**	12	.508**
4	.640**	13	.645**
5	.661**	14	.738**
6	.637**	15	.777**
7	.557**	16	.689**
8	.714**	17	.702**
9	.810**	18	.561**

It is clear from the previous table that the correlation coefficients between the items and the total score of the questionnaires were all good and acceptable. All of them were significant at a significance level less than or equal to (0.05), which indicates high internal validity of the questionnaire items.

The reliability of tools:

The reliability will be tested statistically for the adapted and modified tools by using Cronbach's coefficient alpha statistical test.

Axis	N	Cronbach's alpha Coefficient
Knowledge	10	.843
Experience	8	.856
Total Degree	18	.821

From the table we conclude that the total degree of Cronbach's alpha to the questionnaire was (0.821) which is high value indicate that the reliability of the questionnaire is highly satisfactory



Data Analysis

Collected data will be tabulated and analyzed using suitable statistical test will be used to test the significance of the result obtained and SPSS.

Ethical concerns

- 1) The research ethical approval will be obtained from the EMS services organization in Saudi Arabia before conducting the study.
- 2) An approval will be obtained from EMS services organization.
- 3) The purpose of the study will be simply explained to participants who agree to participate in the study.
- 4) The researcher will assure maintaining anonymity and confidentiality of the subject data.
- 5) Every subject will be informed that they are allowed to choose to participate or not in the study and they have the right to withdraw from the study at any time.

Results & Discussion

Introduction:

Data collection will be analyzed, tabulated and represented using suitable statistical methods.

The questionnaire was prepared to achieve the objectives of the study and answer the questions of the study as the following:

First Characteristics of the research sample:

The frequencies and percentages of the sample were calculated according to the characteristics as the following:

1- Age

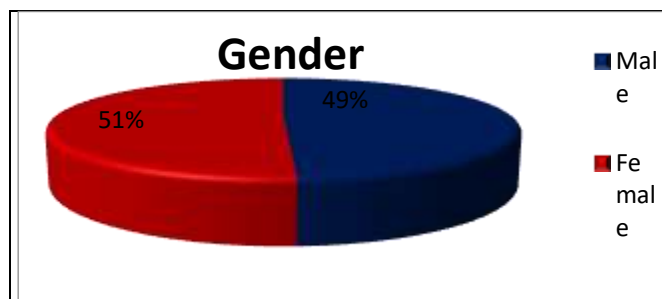
The ages of the study sample ranged from 24 to 52 years, with mean ages (41.19) and a standard deviation of (12.09)

2- Gender

Table (1) Distribution of students by gender

Gender	Frequency	Percent
Male	69	49.3%
Female	71	50.7%
Total	140	100.0

From the above table we conclude that (50.7 %) of the participants are females, and (49.3%) of the participants are males.

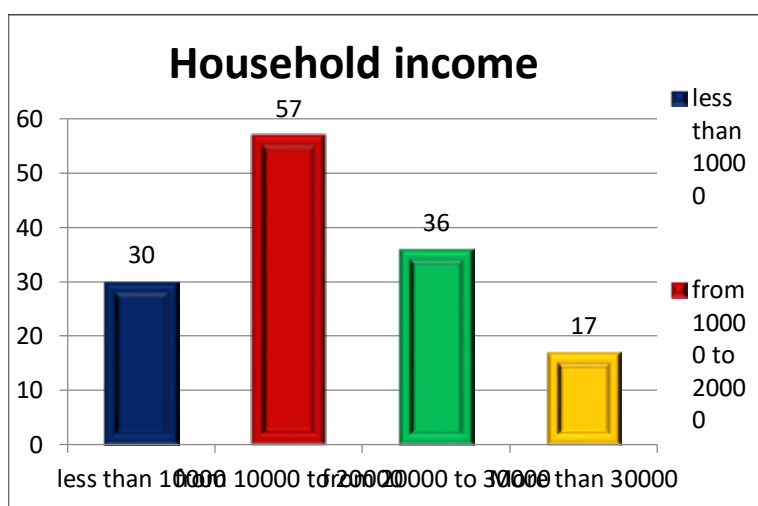


3- Household income

Table (2) Household income

Household income	Frequency	Percent
less than 10000	30	21.4%
from 10000 to 20000	57	40.7%
from 20000 to 30000	36	25.7%
More than 30000	17	12.1%
Total	140	100.0

From the above table we conclude that (40.7 %) of the participants their Household income is from 10000 to 20000, (25.7%) of the participants their Household income is from 20000 to 30000, (21.4%) of the participants their Household income is less than 10000, and (12.1%) of the participants their Household income is More than 30000.

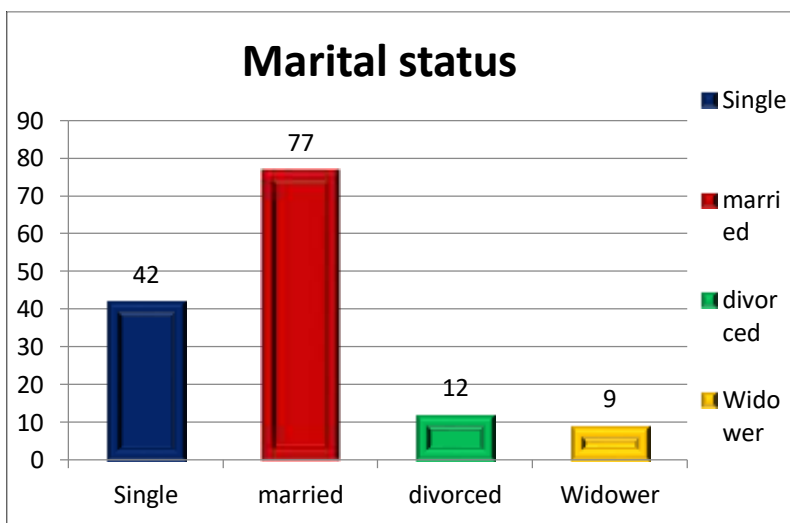


4- Marital status

Table (3) Marital status

Marital status	Frequency	Percent
Single	42	30.0%
married	77	55.0%
divorced	12	8.6%
Widower	9	6.4%
Total	140	100.0

From the above table we conclude that (55 %) of the participants are married, (30%) of the participants are single, (8.8%) of the participants are divorced, and (6.4%) of the participants are Widower.



Second, answer the Research Questions.

The first question What is the knowledge of EMS providers towards control measures?

To answer this question, the frequencies and percentages of the sample's responses on the first axis were calculated, and the results were as follows.

Table (4) the frequencies and percentages of the sample's responses on the first axis

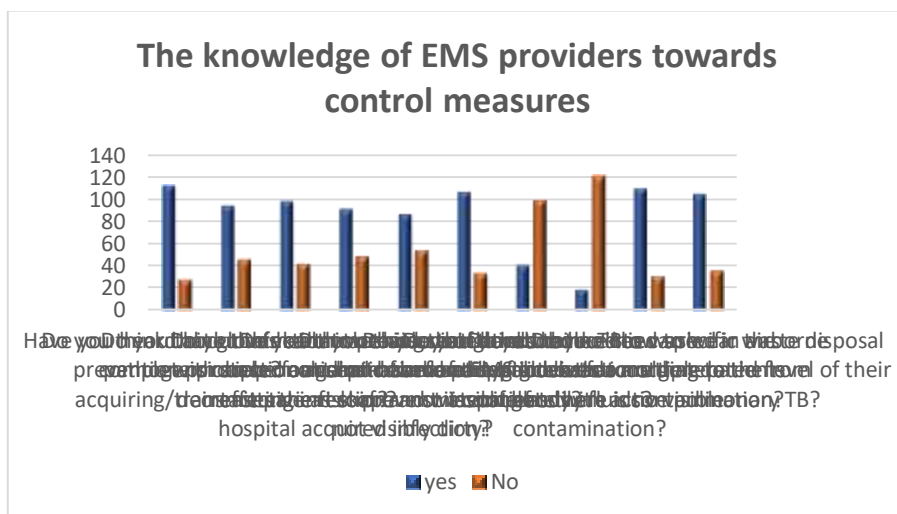
No	Item	Yes		No		Rank	Degree
		N	%	N	%		
1	Have you heard about infection prevention principle?	112	%80,0	28	%20,0	1	Yes
2	Do you think that gloves cannot provide complete protection against acquiring/transmitting infection?	94	%67,1	46	%32,9	6	Yes
3	Do you think that healthcare-associated pathogens can be found on normal and intact patient skin?	98	%70,0	42	%30,0	5	Yes
4	Do you think that washing your hands with soap or alcohol-based antiseptic decreases the risk of transmission of hospital acquired infection?	91	%65,0	49	%35,0	7	Yes
5	Do you think that use of an alcohol-based antiseptic for hand hygiene is as effective as soap and water if hands are not visibly dirty?	86	%61,4	54	%38,6	8	Yes
6	Do you think that gloves reduce the contamination of the hand but do not prevent it completely?	106	%75,7	34	%24,3	3	Yes
7	Do you think that no need to wash hands before EMS interventions that do not involve bodily fluids?	41	%29,3	99	%70,7	9	No
8	Do you think that no need to wear the same pair of gloves for multiple patients as long as there is no visible contamination?	19	%13,6	121	%86,4	10	No
9	Do you think TB is carried in airborne particles that are generated from patients with active pulmonary TB?	109	%77,9	31	%22,1	2	Yes
10	Do you know specific waste disposal buckets according to the level of	104	%74,3	36	%25,7	4	Yes



their contamination?				
Total degree of the axis	61.4%	38.6%	Yes	

From the above table we conclude that the knowledge of EMS providers towards control measures with degree (yes) which means that the high degree of the knowledge of EMS providers towards control measures where:

(80%) of participant agree that they heard about infection prevention principle , (67.1%) of participant think that gloves cannot provide complete protection against acquiring/transmitting infection,(70%) of participant think that healthcare-associated pathogens can be found on normal and intact patient skin ,(65%) of participant think that washing your hands with soap or alcohol-based antiseptic decreases the risk of transmission of hospital acquired infection, (61.4%) of participant think that use of an alcohol-based antiseptic for hand hygiene is as effective as soap and water if hands are not visibly dirty , (75.7%) of participant think that gloves reduce the contamination of the hand but do not prevent it completely, (70.7%) of participant think that they need to wash hands before EMS interventions that do not involve bodily fluids, (86.4%) of participant think that they need to wear the same pair of gloves for multiple patients as long as there is no visible contamination, (77.9%) of participant think TB is carried in airborne particles that are generated from patients with active pulmonary TB ,and (74.3%) of participant know specific waste disposal buckets according to the level of their contamination



The second question What is the experience of EMS providers towards prevention of infectious diseases?

To answer this question, the frequencies and percentages of the sample’s responses on the second axis were calculated, and the results were as follows.

(1) How often do you wash your hands with proper detergent after contact with patient?

Table (5) How often do you wash your hands with proper detergent after contact with patient?

Answers	Frequency	Percent
Always	84	60.0%
Sometimes	40	28.6%
Never	16	11.4%
Total	140	100.0

From the above table we conclude that (60 %) of the participants always wash their hands with proper detergent after contact with patient, (28.6%) of the participants sometimes wash their hands with proper detergent after contact with patient, and

(11.4%) of the participants never wash their hands with proper detergent after contact with patient.

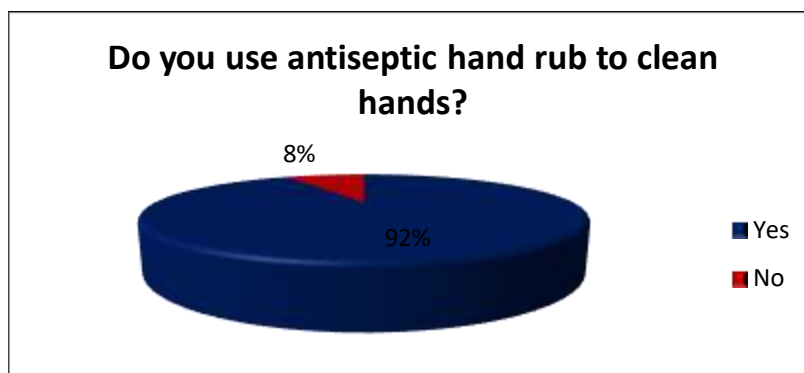


(2) Do you use antiseptic hand rub to clean hands?

Table (6) Do you use antiseptic hand rub to clean hands.

Answers	Frequency	Percent
Yes	129	92.1%
No	11	7.9%
Total	140	100.0

From the above table we conclude that (92.1 %) of the participants use antiseptic hand rub to clean hands, and (7.9%) of the participants don't use antiseptic hand rub to clean hands.

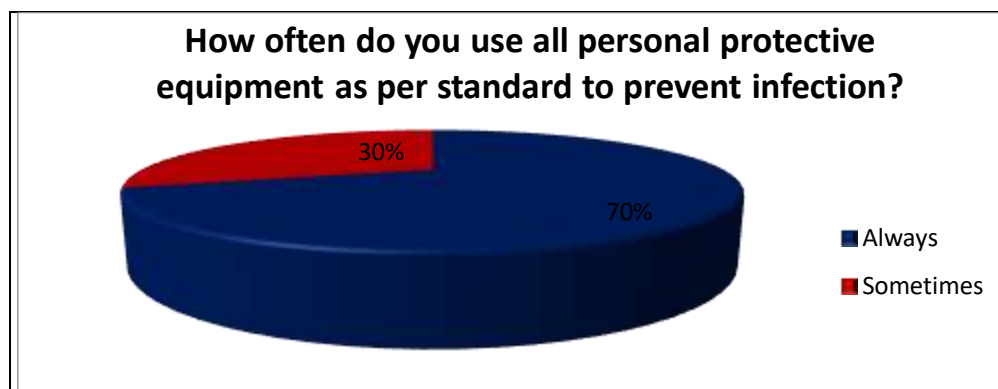


(3) How often do you use all personal protective equipment as per standard to prevent infection?

Table (7) How often do you use all personal protective equipment as per standard to prevent infection?

Answers	Frequency	Percent
Always	98	70.0%
Sometimes	42	30.0%
Total	140	100.0

From the above table we conclude that (70 %) of the participants always use all personal protective equipment as per standard to prevent infection, and (30%) of the participants Sometimes use all personal protective equipment as per standard to prevent infection.



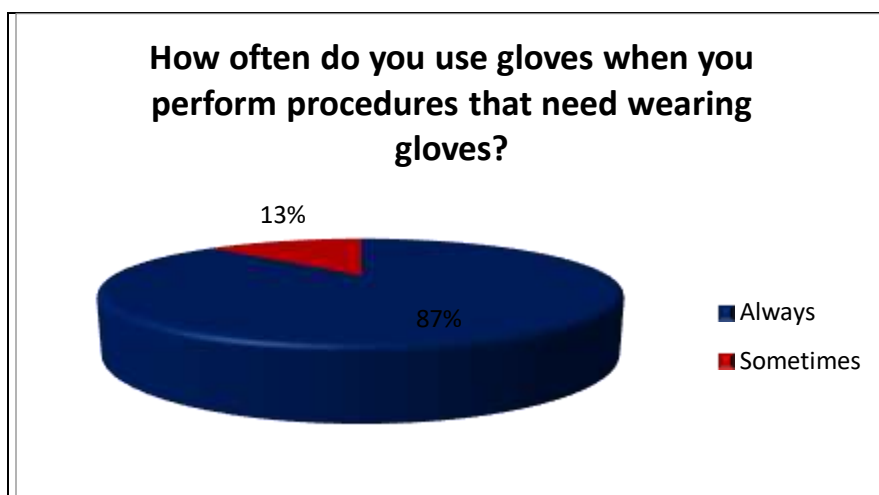
(4) How often do you use gloves when you perform procedures that need wearing gloves?

Table (8) How often do you use gloves when you perform procedures that need wearing gloves?

Answers	Frequency	Percent
Always	122	87.1%
Sometimes	18	12.9%
Total	140	100.0

From the above table we conclude that (87.1 %) of the participants always use gloves when they perform procedures that need wearing gloves, and (12.9%) of the

participants sometimes use gloves when they perform procedures that need wearing gloves.

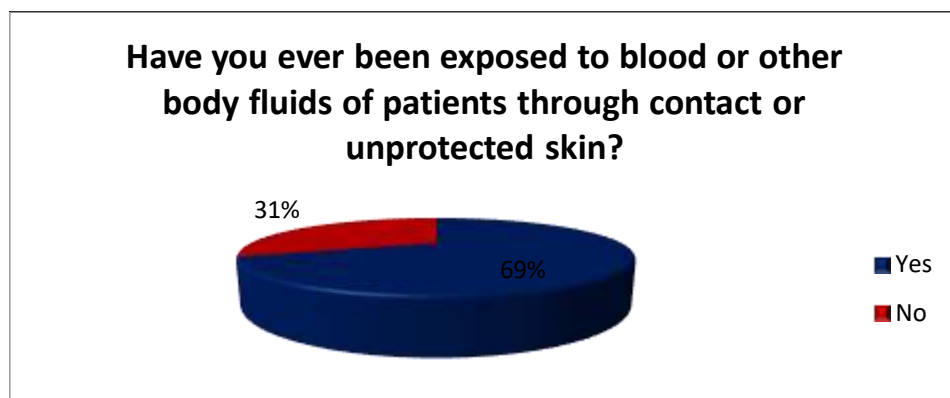


(5) Have you ever been exposed to blood or other body fluids of patients through contact or unprotected skin?

Table (9) Have you ever been exposed to blood or other body fluids of patients through contact or unprotected skin?

Answers	Frequency	Percent
Yes	97	69.3%
No	43	30.7%
Total	140	100.0

From the above table we conclude that (69.3 %) of the participants have ever been exposed to blood or other body fluids of patients through contact or unprotected skin, and (30.7%) of the participants have never been exposed to blood or other body fluids of patients through contact or unprotected skin.



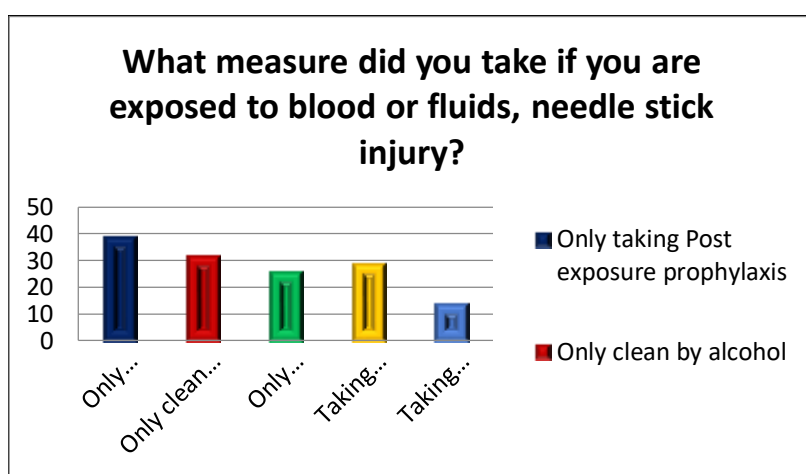
(6) What measure did you take if you are exposed to blood or fluids, needle stick injury?

Table (10) What measure did you take if you are exposed to blood or fluids, needle stick injury?

Answers	Frequency	Percent
Only taking Post exposure prophylaxis	39	27.9%
Only clean by alcohol	32	22.9%
Only washing with water	26	18.6%
Taking Post exposure prophylaxis and clean by alcohol	29	20.7%
Taking post exposure prophylaxis and washing with water	14	10.0%
Total	140	100.0

From the above table we conclude that (27.9%) of the participants the measure did they take if they are exposed to blood or fluids, needle stick injury is Only taking Post exposure prophylaxis , (22.9%) of the participants the measure did they take if they are exposed to blood or fluids, needle stick injury is Only clean by alcohol , (20.7%) of the participants the measure did they take if they are exposed to blood or fluids, needle stick injury is Taking Post exposure prophylaxis and clean by alcohol, (18.6%) of the participants the measure did they take if they are exposed to blood or

fluids, needle stick injury is Only washing with water ,and (10%) of the participants the measure did they take if they are exposed to blood or fluids, needle stick injury is Taking post exposure prophylaxis and washing with water .



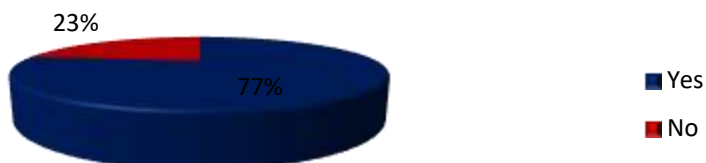
(7) Did you practice high-level disinfection where sterilization is not applicable?

Table (11) Did you practice high-level disinfection where sterilization is not applicable?

Answers	Frequency	Percent
Yes	108	77.1%
No	32	22.9%
Total	140	100.0

From the above table we conclude that (77.1 %) of the participants practiced high-level disinfection where sterilization is not applicable, and (22.9%) of the participants didn't practice high-level disinfection where sterilization is not applicable.

Did you practice high-level disinfection where sterilization is not applicable?



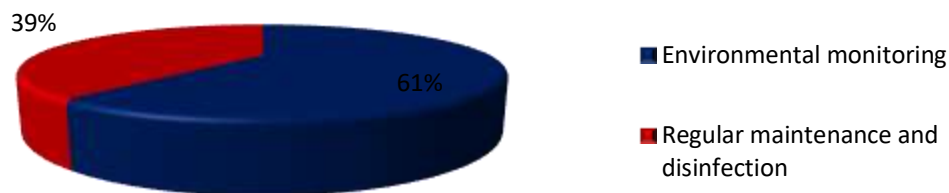
(8) What is your facility sterilization technique?

Table (12) What is your facility sterilization technique?

Answers	Frequency	Percent
Environmental monitoring	85	60.7%
Regular maintenance and disinfection	55	39.3%
Total	140	100.0

From the above table we conclude that (60.7 %) of the participants their facility sterilization technique is Environmental monitoring, and (39.3%) of the participants their facility sterilization technique is Regular maintenance and disinfection.

What is your facility sterilization technique?





Main points in results:

The main objective of this research aims to assess the experience and knowledge of EMS providers towards methods of prevention of infectious diseases and control measures. The questionnaire was prepared to achieve the objectives of the study and answer the questions of the study. The questionnaire was designed by looking at some of the tools and measures of other studies relevant to the current research topic to answer the following research questions are posed:

1. What is the experience of EMS providers towards prevention of infectious diseases?
2. What is the knowledge of EMS providers towards control measures?

Discussion

According to demographic results, it was found that The ages of the study sample ranged from 24 to 52 years, with mean ages (41.19), (50.7 %) of the participants are females, and (49.3%) of the participants are males.

According to knowledge, the knowledge of EMS providers towards control measures with degree (yes) which means that the high degree of the knowledge of EMS providers towards control measures.

According to experience, the results found good experience of EMS providers towards control measures.

A study done in Saudia Arabia found that There were no or limited access to particular infection prevention and control (IPC) guidelines and training programs. This resulted in a reliance on gut feelings, information from prior academic



coursework, and infrequently personal growth endeavors, especially in prehospital environments. In fact, several participants blamed EMS providers' lack of understanding for the inadequacies in the use of preventative measures. The absence of an IPC training program was cited by 51.73% of HCPs in a recent KSA survey as a risk factor for disease outbreaks in healthcare institutions.⁵ Therefore, the creation of consistent IPC training programs for EMS professionals across all contexts would aid in closing the knowledge gap, influencing attitudes, and enhancing IPC practice (Khan, 2019).

It's crucial to research the hand hygiene habits of EMS personnel for a number of reasons. Medical directors and educators can create policies to raise awareness and detect deficiencies in pre-hospital hygiene by using the rates of hand hygiene before hospitals. Identifying barriers to hand hygiene that keep emergency medical services professionals from properly washing their hands may also be helpful. It may lessen the spread of microbes between patients and emergency medical services personnel and shield commonly touched equipment—like stethoscopes, backboards, cervical collars, blood pressure monitors, and other patient transport tools—from contamination (Bucher et al., 2015).

On the other hand, a previous study found that Just 56% of the respondents were aware that infections like *Clostridium difficile* and the Norwalk virus cannot be eliminated by alcohol-based hand sanitizers, thus hand washing with soap and water is necessary after treating patients with gastrointestinal disorders. Twelve Merely 52% of participants stated that they always use gloves when interacting with patients. Similar to this, just 33% of respondents said they cleansed their hands



following invasive treatments; however, given the dearth of hand hygiene products in the ambulance, this data may be distorted (Bucher et al., 2015).

The main objective of this research aims to assess the experience and knowledge of EMS providers towards methods of prevention of infectious diseases and control measures and according to findings found that good experience and knowledge of EMS providers towards methods of prevention.

Conclusion:

The knowledge of EMS providers towards control measures with degree (yes) which means that the high degree of the knowledge of EMS providers towards control measures. (60 %) of the participants always wash their hands with proper detergent after contact with patient. (92.1 %) of the participants use antiseptic hand rub to clean hands. (70%) of the participants always use all personal protective equipment as per standard to prevent infection. (87.1 %) of the participants always use gloves when they perform procedures that need wearing gloves. (69.3 %) of the participants have ever been exposed to blood or other body fluids of patients through contact or unprotected skin. (27.9%) of the participants the measure did they take if they are exposed to blood or fluids, needle stick injury is Only taking Post exposure prophylaxis. (77.1 %) of the participants practiced high-level disinfection where sterilization is not applicable. (60.7 %) of the participants their facility sterilization technique is Environmental monitoring.



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Recommendation

- It is necessary to take the recommended vaccinations for all individuals.
- Always wash your hands well with soap and water.
- Cover the nose and mouth when sneezing or coughing with a tissue, or with the elbow of the hand if tissues are not available.
- Avoid direct touch with any paper or cloth tissues of unknown origin.
- Avoid direct contact or sharing personal items with an infected person, such as a toothbrush, shaving kit, or comb.
- Avoid drinking or swimming in contaminated water.
- Avoid eating food and drinking drinks brought by an infected person.
- Sterilize surfaces, tables, and shelves periodically.

Acknowledgment

I extend my sincere appreciation to all my EMS colleagues generally and the EMS research community for their encouragement and constructive feedback, contributing significantly to the development of this individual work. Your support has been truly invaluable.



References

1. Alhumaid, S., Al Mutair, A., Al Alawi, Z., Alsuliman, M., Ahmed, G. Y., Rabaan, A. A., Al-Tawfiq, J. A., & Al-Omari, A. (2021). Knowledge of infection prevention and control among healthcare workers and Factors Influencing Compliance: A systematic review. *Antimicrobial Resistance & Infection Control*, 10(1). <https://doi.org/10.1186/s13756-021-00957-0>
2. Aringhieri, R., Bruni, M. E., Khodaparasti, S., & van Essen, J. T. (2017). Emergency medical services and beyond: Addressing new challenges through a wide literature review. *Computers & Operations Research*, 78, 349–368. <https://doi.org/10.1016/j.cor.2016.09.016>
3. Assefa, J., Alen, G. D., & Adane, S. (2020). Infection prevention knowledge, practice, and its associated factors among healthcare providers in primary healthcare unit of Wogdie District, Northeast Ethiopia, 2019: A cross-sectional study. *Antimicrobial Resistance & Infection Control*, 9(1). <https://doi.org/10.1186/s13756-020-00802-w>
4. Khan, A. A. (2019). Emergency medical services providers' experiences and attitudes toward infection prevention and control measures in Saudi Arabia: A qualitative study. *Disaster Medicine and Public Health Preparedness*, 14(6), 713–718. <https://doi.org/10.1017/dmp.2019.108>
5. Liang, S. Y., Theodoro, D. L., Schuur, J. D., & Marschall, J. (2014). Infection prevention in the emergency department. *Annals of Emergency Medicine*, 64(3), 299–313. <https://doi.org/10.1016/j.annemergmed.2014.02.024>



6. Sayed, M. E., Kue, R., McNeil, C., & Dyer, K. S. (2011). A descriptive analysis of occupational health exposures in an Urban Emergency Medical Services System: 2007–2009. *Prehospital Emergency Care*, 15(4), 506–510. <https://doi.org/10.3109/10903127.2011.598608>
7. Bucher, J., Donovan, C., Ohman-Strickland, P., & McCoy, J. (2015). Hand washing practices among emergency medical services providers. *Western Journal of Emergency Medicine*, 16(5), 727–735. <https://doi.org/10.5811/westjem.2015.7.25917>
8. Al Amiry, A., & Maguire, B. J. (2021). Emergency medical services (EMS) calls during COVID-19: Early lessons learned for systems planning (a narrative review). *Open Access Emergency Medicine*, Volume 13, 407–414. <https://doi.org/10.2147/oaem.s324568>
9. Afshari, A., Borzou, S. R., Shamsaei, F., Mohammadi, E., & Tapak, L. (2021). Perceived occupational stressors among Emergency Medical Service Providers: A qualitative study. *BMC Emergency Medicine*, 21(1). <https://doi.org/10.1186/s12873-021-00430-6>
10. Cash, R. E., Rivard, M. K., Camargo, C. A., Powell, J. R., & Panchal, A. R. (2021). Emergency medical services personnel awareness and training about personal protective equipment during the COVID-19 pandemic. *Prehospital Emergency Care*, 25(6), 777–784. <https://doi.org/10.1080/10903127.2020.1853858>