

ORIGINAL ARTICLE

Open Access



Challenges facing Palestinian crime scene investigators

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Abstract

Background Crime scene investigation (CSI) in general means the standard procedures and techniques used for processing and reconstructing of scene of crime. In Palestine, the competent authorities delegated by law to carry out the task of research and investigation of crimes and inspection at the crime scene are the officers granted by law the status of the judicial police. CSIs face numerous challenges that affect every worker involved. These challenges arise from legal, administrative, security, and technical aspects. This study aimed to point out the challenges faced by field police personnel during CSI in Palestine. To achieve the aims of this study, a validated and reliable questionnaire was developed. The study sample consisted of 354 crime scene investigators and officers affiliated with the Palestinian Civil Police (PCP) across all governorates of the West Bank.

Results In addition to the training of CSI officers, and shortage of equipment, the findings of this study indicate that there are many challenges amplified by the Israeli occupation facing PCP officers concerning crime scene management and technical procedures during CSIs such as the collection, transportation, and storage of forensic evidence. Overlapping responsibilities and difficulties in coordinating specialized agencies working at the crime scene are also factors that should be better studied.

Conclusion This study invites decision-makers within the Palestinian police agencies to prioritize efforts to address the significant challenges encountered by workers at crime scenes. They should give special attention on enhancing training programs and providing the necessary tools and devices for effective crime scene work. It also recommends Palestinian representatives at international stage to highlight the obstacles facing workers at crime scenes due to the occupation.

Keywords Crime scene, Crime scene investigation, Palestinian Civil Police, Challenges, Forensic science, Forensic evidence

Background

Crime is part to any human societies. A crime scene is defined as any locations of interest for searching relevant evidence (called traces) of the investigated event (Houck et al. 2018).

Crime scene investigation (CSI) encompasses carrying out all legitimate procedures and methods to reconstruct this past. CSI stated in Sydney declaration about principles of forensic science as a scientific and diagnostic endeavor that requires scientific expertise (Roux et al. 2022). As for the technical criminal investigation, it is the use of scientific and technical means that help the investigator to reveal and clarify the features of the

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crime. It is not just the scientific matter of forensic analysis; the behavioral approach should not be overlooked in CSI. The investigative psychologist plays an important role in solving the investigation (de Roo et al. 2022). In addition, it helps illuminate the investigation in all its aspects by collecting evidence that proves the occurrence of the crime and how it occurred (Rod and Darryl 2016). CSI is essentially a management and scientific process that begins after the first information report has been recorded and the first officer's arrival at the scene, followed by the subsequent proceedings such as securing and protecting the crime scene, fulfilling basic legal requirements, recording the crime scene, and identifying, distinguishing, collecting, labelling, and packaging physical evidence. Other important procedures for CSI include preserving, interpreting, and reconstructing all relevant physical evidence at a crime scene. CSI persists until it is transferred appropriately to the forensic laboratory for further analysis and examination (Saferstein 1998; Jim 2010; Lee and Pagliaro 2013; Joseph 2022).

Lately, new technologies have been introduced into CSI. Esposito et al. (2023) demonstrated in his recent study that 3D scanning technology is used fruitfully to obtain dense surface scans of large-scale spaces in forensic science such as measurement of wounds in clinical reports, bullet trajectory studies in gunshot wounds, bloodstain pattern analysis, and reconstruction of traffic accidents. Recently, with the increase in crime rates and the polymorphism of its means, the CSI's challenges facing the authorities charged with fighting it have increased. Statistical data on crimes and their types in

Palestine were presented in Khalilia (2023). In detail, 1.1% of respondents experienced criminal activity. The most common crimes committed against persons were theft (57.3%), assaults/threats (19.6%), harassment or assault by Israeli military or settlers (11.8%), property damage (4.8%), and attempted robbery/theft (3.6%) (Khalilia 2023). In 2022, regarding the Palestinian Central Bureau of Statistics (PCBS), the number of criminal offenses in Palestine per 10,000 residents was as follows: in Jenin (190), Nablus (73), Tubas (131), Tulkarm (116), Jericho (319), Jerusalem (28), Qalqilya (164), Ramallah (136), Salfit (215), Bethlehem (122), and Hebron (74) (Table 1).

Criminals take full advantage of the steady advancements in technology by creating various innovative methods to hide or disguise the evidence of their crimes. The competent security services, on the other hand, sought to harness the data of modern forensic science to support the techniques conducted by the judicial police with clues and evidence capable of opening closed paths in the manifold investigation paths (Oliveira 2021). Around the world, investigative officers face problems in CSIs, the most important of which is the alteration and destruction of physical evidence at crime scenes by curious people before the arrival of police officers. The limited specialized training of crime scene teams is one of the problems facing the investigation. In addition, the lack of tools and equipment needed to collect, store, and transfer physical evidence is another problem facing crime scene officers (Shah and Basharat 2020; Prince et al. 2021). In addition to these obstacles facing criminal investigators around the world, CSIs in Palestine are facing additional

Table 1 Number of Palestinian police employees at the crime scene for each of the northern governorates (West Bank)

District within the West Bank	Governorate	Total population ^a	Total no. of criminal offense ^b	No. of CRU officers	No. of CIU officers	No. of first officers	Total (N) ^c	% of N
North	Jenin	352875	6735	40	14	47	101	37.3
	Nablus	431584	3154	43	14	63	120	
	Tubas	68779	904	15	10	16	41	
	Tulkarm	205946	2401	29	11	39	79	
Middle	Jericho	55268	1761	16	11	31	58	42.0
	Jerusalem	492340	1370	21	10	16	47	
	Qalqilia	127025	2084	17	10	29	56	
	Ramallah	370030	5053	48	15	123	186	
South	Bethlehem	244704	2991	18	13	48	79	20.7
	Hebron	822435	6089	31	12	67	110	
Total		3256906	34391	290	129	495	914	100
% of total CSI Officers					31.7	14.1	54.2	100

^a (PCBS 2023). ^bTypes of criminal offense: murder, kidnapping, rape, assault, harming, narcotic drugs, theft/robbery, forgery/fraud, prejudice the course of justice, assault government employees, possessing/trading with expired food or medicine, arson, shooting, suspected crimes, crimes against public order, corruption, and threat (PCBS 2022b). ^cN = first officers + CIU + CRU

problems due to the Israeli occupation, which hinders movement between Palestinian cities, placing special conditions on some of the equipment necessary for investigations, and preventing some investigators from traveling abroad to attend important training courses.

In the Palestinian situation, the competent authorities delegated by the legislator to carry out the task of crime investigation, and intelligence, are the persons granted the status of judicial investigation officers by law. Article 21 of the Criminal Procedures Law No. 3 of 2001 singled out police officers and some persons who are granted the status of judicial officers according to both their special competences and the tasks assigned to them. The Palestinian Civil Police (PCP) was established at the beginning of the return of the Palestinian authority into the homeland in 1994. It has been divided administratively so that each of its departments undertakes specific competencies entrusted to it in addition to its general competence in controlling crimes. The Palestinian Basic Law emphasized the existence of the police force and the purposes for which it was established, until Law No. 23 of 2017 regarding the PCP was issued, which detailed the tasks, duties, and powers that must be carried out in order to achieve the goals set by law. In general, the responsibility for examining the crime scene in the PCP includes the Criminal Research Unit (CRU) and Criminal Investigations Unit (CIU), along with the first officers. In Palestine, police officers are selected to work in CSI based on the candidates' specialization, provided that they undergo an integrated training program that includes nontechnical courses such as basics in forensic sciences, crime scene, awareness sessions on the work of all sections of the forensic laboratory, and managing forensic evidence. These police officers then pass the specialized technical training program approved for each section of the criminal laboratory and document the training record according to the quality guide. In addition, the same officers are exposed to general courses in public health and safety, emergency and environmental plans, chemical waste management plan, and quality system requirements, so that they become qualified to work as crime scene investigators.

In terms of their place of work, the employees of the PCP are divided into southern governorates (Gaza Strip) and northern governorates (West Bank). Based on the statistics carried out by the management and organization department in the PCP at the end of 2020, it was found that the number of employees serving in the CSIs in the West Bank is as shown in Table 1 and represents 16.2% of total police officers working in the northern governorates.

The main goal of this study, which was based on the cooperation of the researchers from the PCP and

Al-Istiqlal University, is to determine the challenges faced by PCP officers during CSIs. Specifically, the objectives is to determine the technical procedures and crime scene management challenges in order to provide research-based recommendations to overcome obstacles facing PCP officers in Palestine. This research also aims to explore the demographic parameters of workers at the crime scene (i.e., gender, level of education, length of service at the CSI, rank, respondents' working unit, and respondents' working place) and how these parameters impact the administrative and technical CSIs challenges they face.

This study is also important for police detective officers in order to identify problems in reference to other stakeholders in the investigation procedure, such as forensic science providers. However, no studies have been conducted to assess the challenges encountered during CSIs in Palestine.

Methods

Study sample

This study was a descriptive cross-sectional survey through a survey questionnaire, and the target group was workers in CSI from the Palestinian police in the northern Palestinian governorates. The populations were all of the employees serving in the CSIs in the West Bank. Stratified random sampling technique was used in selecting the samples that are representative of the study population based on gender, level of education, length of service at the CSI, rank, and respondents' working unit and place, and finally, 354 employees were surveyed. The total number of people in the research community and the number of samples are shown in Table 1. The survey started in June 2020, and data collection ended in September 2020.

For legal reasons and to optimize feedbacks from the field, Ramallah PCP leaders were provided a copy of the survey form and were informed of the purpose of this study. Accordingly, written orders were issued to all directors of the concerned departments in the PCP agencies in all governorates in the West Bank to facilitate the task of the researchers. The participants were given the freedom to answer the questionnaire or not without any follow-up or any harassment. Since the study sample was stratified, there had to be some senior ranks (colonel or above). In order to ensure no bias, their percentages in the study were low (4.8%). Also, most of the questionnaire questions were general and not specific to the officers' place of service. In addition, the survey followed the ethical principles of the Declaration of Helsinki and approved by the Ethics Committee of Al Istiqlal University.

The questionnaire

By using the information obtained from the review of similar studies (Muthini 2018; Parmar 2018) and a survey of online resources, an item-based questionnaire was developed and used as a tool to examine the challenges facing crime scene investigators and officers from the PCP. The content validity of the initial questionnaire was measured through a peer review approach online according to the pre-test method (Lucas and Sharpe 1969). It was presented to five peer reviewers who are faculty staff members from Al Istiqlal University. It is a 5-point Likert scale type questionnaire (1, strongly disagree; 2, disagree; 3, neutral; 4, agree; and 5, strongly agree). The content validity of the initial questionnaire was measured through a peer review approach online according to the pre-test method (Lucas and Sharpe 1969). It was presented to five peer reviewers who are faculty staff members from Al Istiqlal University. The form consisted of 32 questions distributed in three sections. The first section covered “personal and demographic variables” (6 questions), and the other two sections were grouped into “challenges regarding crime scene management” (15 questions) and “challenges regarding technical procedures at crime scenes” (11 questions) (Appendix 1). The questionnaire was delivered to 400 crime scene investigators working in the PCP, and 354 of them were returned and analyzed with a responding rate of 88.5%.

Statistical analysis

The data obtained from the statistical population ($n = 354$) were analyzed using the Statistical Package for Social Sciences (SPSS version 22), descriptive statistics (frequency distribution and mean reports), and inferential statistics (variance analysis and t -test). As well as a preliminary study for measurement, reliability and internal consistency were determined by using Cronbach's alpha. Significance level was set at $p < 0.05$. Interviewees' responses to the questionnaire were quantitatively and independently analyzed by the authors for repetitive themes and then summarized. Results of the demographic questions (Section 1) were expressed as a percentage of their relative occurrence for each question. For sections 2 and 3, the means and standard deviations were calculated.

Results

Questions related to management challenges included the number of experts and specialists, the necessary equipment and tools, the number of forensic laboratories, coordination among CSI team members, dealing with the public, quick access to the crime scene, occupation, and initial documentation in CSIs. On the other

hand, challenges related to technical procedures at crime scenes were assessed, such as safety and security requirements and conditions while working at the crime scene and documenting, collecting, transporting, and storing forensic evidences.

Cronbach's alpha was used for assessing the internal consistency of the questionnaire. Accordingly, the alpha value for the participants' challenges facing administrative and technical procedures at the crime scene was (0.916). This value was above the (0.70) threshold which is generally used as a rule of thumb (Taber 2018), and it was concluded that their internal consistency was satisfactory.

Data analysis of the studied variables

We received (354) responses out of the (400) targeted crime scene investigators working in the PCP, resulting in a response rate of 88.5%. They were affiliated with the PCP in all governorates of the West Bank, from which 53.1% were officers from the CRU, 31.1% were first officers, and 15.8% were officers from the CIU. The respondents' personal and demographic profiles were assessed and summarized in Fig. 1 and Table 2. The demographic attributes considered included the following: the respondents' gender, level of education, length of service at the CSI, rank, respondents' working unit, and respondents' working governorate.

Regarding the gender of the respondents, 87.0% were identified themselves as males, consistent with the force general manpower (PCBS 2018). As for their highest academic qualification, it was found that 27.1% held high school or lower degrees, 19.8% had an intermediate diploma, and 47.5% had a bachelor's degree, while 5.6% had a postgraduate degree. Concerning the years of serving at the CSI, 40.7% of the participants had worked at the CSI for less than 5 years, 22.0% had worked between 5 and 10 years, and 18.1% had worked between 11 and 15 years, while 19.2% had worked for more than 15 years (Fig. 1), (Table 2).

Although the number of first officers is higher than that of individuals and officers in the other units, as shown in Table 1, more officers and individuals of the CRU participated in this study. This is because the nature of their work is more comprehensive in the CSIs. According to the working district, 29.7% of the respondents work in the South governorates, 32.5% in the North governorates, and 37.8% in the Middle governorates of the West Bank in Palestine.

Challenges facing CSI officers

Data collected from CSI officers working in crime scene management, and technical procedures used on it, were analyzed and presented in Table 3.



Fig. 1 Distribution of the respondents according to the sociodemographic profiles

Table 2 Distribution of the respondent community according to the independent variables

Variables	Category	Frequency	Percentage %
Gender	Male	308	87.0
	Female	46	13.0
Educational level	High school or lower	96	27.1
	Intermediate diploma	70	19.8
	Bachelor degree	168	47.5
	Postgraduate degree	20	5.6
Rank	Less than first lieutenant	42	11.9
	From lieutenant to captain	189	53.4
	Major and lieutenant colonel	106	29.9
	Colonel and above	17	4.8
Years of service (at CSI)	Less than 5	144	40.7
	From 5 to 10	78	22.0
	From 11 to 15	64	18.1
	More than 15	68	19.2
Department/unit	Criminal research (CRU)	188	53.1
	First officers	110	31.1
	Criminal investigations (CIU)	56	15.8
Workplace district	South	105	29.7
	North	115	32.5
	Middle	134	37.8

Table 3 Descriptive statistical analysis of challenges facing Palestinian crime scene investigators

No.	Questions	Mean	Std.
Section 2: Challenges facing crime scene management			
1.	Military occupation barriers between cities impede the movements of the Palestinian crime scene teams	4.01	1.22
2.	There is interference and obstruction from the occupation in the investigations of some crime scenes in Palestine	3.98	1.13
3.	Occupation prevents the crime scene team from entering C classified areas (full Israeli control) in Palestine	3.87	1.11
4.	There is an obstruction in the workflow due to the curious and the public entering the crime scene	3.85	1.14
5.	There are not enough experts and specialists in CSIs	3.82	1.13
6.	The occupation prevents some cadres from traveling to receive courses and training on crime scenes outside the country	3.79	1.12
7.	There is a shortage in the number of forensic laboratories for the analysis of forensic evidence	3.79	1.08
8.	Lengthy lawsuits lead to contamination and accumulation of forensic evidence	3.78	1.14
9.	There is a lack of equipment and tools to work at a crime scene	3.78	1.12
10.	Overlapping ranks and overlapping responsibilities hinder CSI	3.78	1.19
11.	There is a delay in the investigation of the crime scene due to the difficulty of quick access to it	3.68	1.11
12.	There is difficulty in coordinating between the specialized agencies working at the crime scene	3.68	1.16
13.	There is a difficulty in the identifying a team that is specializes in crime scenes	3.62	1.11
14.	There are obstacles in reaching the scene of the accident resulting from a lack of coordination by the initial response	3.52	1.10
15.	There are difficulties with the initial documentation and assessment of the crime scene	3.48	1.01
Overall score for this section		3.76	0.81
Section 3: Challenges facing technical procedures at crime scenes			
1.	The occupation prevents the entry of some equipment and tools necessary for the investigation of the crime scene	3.94	1.13
2.	The Israeli occupation barriers impede the transfer of forensic evidence from the crime scene to their storage place, which sometimes causes damage	3.92	1.13
3.	The unavailability of all types of forensic examination of the various forensic evidences in criminal laboratories	3.82	1.12
4.	The absence of requirements for weather conditions that may affect and damage the evidence	3.82	1.03
5.	Secure storage facilities are inadequate for storing forensic evidence.	3.81	1.10
6.	There is a shortage of specialized courses dealing with various evidences at the crime scene	3.77	1.19
7.	There is a lack of tools, containers, and proper conditions or storing evidence	3.77	1.12
8.	Lack of a secure place to store forensic evidence	3.74	1.14
9.	The lack of adequate clothing and tools for safety and security at the crime scene	3.72	1.12
10.	Excessive heat that destroys forensic evidence collected from a scene	3.70	1.07
11.	Exposure to risks due to noncompliance with safety conditions while working at the crime scene	3.65	1.08
Overall score for this section		3.79	0.83
Overall score for both sections		3.78	0.78

Table 3 indicates that the total score for the second section, “challenges facing crime scene management,” was significant, with a mean of 3.76 and a standard deviation of 0.81. In the second section, the results show that questions (1–3, 6) about occupation barriers, prevention, and obstruction received the highest evaluation rate by PCP officers, while questions (11–15) (Table 3) about the first officer duties at crime scene received the lowest evaluation rate. The total score for the third section, “challenges facing technical procedures at crime scenes,” was

significant, with a mean of 3.79 and a standard deviation of 0.83. Results also show in this section that the questions (16 and 17) (Table 3) about the Israeli occupation barriers received the highest evaluation rate by PCP officers, while the question “the exposure to risks due to non-compliance with safety conditions while working at the crime scene” has the lowest evaluation rate by PCP officers, with a mean of 3.65. The overall score for the challenges facing CSI officers has an average of 3.78 and a standard deviation of 0.78. In addition, it is clear from the

results of the questionnaire analysis of this study that all paragraphs' means were more than 3.5 (Table 3).

Challenges according to the studied variables

The answers of the participants in this study were analyzed according to the demographic variables (i.e., the respondents' gender, level of education, length of service at the CSI, rank, respondents' working unit and respondents' working governorate), and the results are shown in Tables 4, 5, 6, 7, 8 and 9.

It is clear from Table 4 that the results support the hypothesis that there is no significant differences ($P < 0.05$) between the means of CSI officer's responses according to gender in the field of crime scene management, technical procedures at crime scenes, and in the overall field.

It is clear from the results (Table 5) that there is a significant difference ($P < 0.05$) among the means of the responses according to the educational qualification variables. It was found that the CSI officers holding intermediate or lower diploma are facing more challenges than

those with higher education in crime scene management and technical procedures at crime scenes.

Table 6 presents the findings that support our hypothesis that there are no statistically significant differences ($P > 0.05$) between the means of respondents of CSI officers according to years of service at CSI, in the field of crime scene management, technical procedures at crime scenes, and in the overall field.

It was found that there is a significant difference ($P < 0.05$) between the average responses of CSI officers toward the challenges in the field of crime scene management, technical procedures at crime scenes, and in the overall field due to the military rank variable. The highest averages were for the lieutenant to captain levels, while the lowest averages were for the colonel and above ranks (Table 7).

It is clear from Table 8 that a significant difference ($P < 0.05$) was found between averages of CSI officers' responses according to department variables. In the fields of challenges for crime scene management and for technical procedures at crime scenes, CIU officers have the

Table 4 Means, standard deviations, and one-way ANOVA analysis of challenges facing Palestinian crime scene investigators according to gender

Field	Gender	N	Mean	Std.	F	(Sig)*
Challenges facing crime scene management	Male	308	3.77	0.83	0.59	0.444
	Female	46	3.74	0.70		
Challenges facing technical procedures at crime scenes	Male	308	3.81	0.84	0.91	0.340
	Female	46	3.68	0.77		
Challenges overall	Male	308	3.78	0.80	0.73	0.393
	Female	46	3.71	0.68		

*Statistically significant at $p < 0.05$, degrees of freedom (df) = 353

Table 5 Means, standard deviations, and one-way ANOVA analysis of challenges facing Palestinian crime scene investigators according to level education

Field	Academic Level	N	Mean	Std.	F	(Sig)*
Challenges facing crime scene management	High school or lower	96	3.83	0.82	2.67	0.048
	Intermediate Diploma	70	3.79	0.77		
	Bachelor	168	3.78	0.77		
	Postgraduate	20	3.28	1.14		
Challenges facing technical procedures at crime scenes	High school or lower	96	3.91	0.75	6.45	0.000
	Intermediate diploma	70	3.90	0.81		
	Bachelor	168	3.76	0.79		
	Postgraduate	20	3.07	1.16		
Challenges overall	High school or lower	96	3.87	0.76	4.39	0.005
	Intermediate diploma	70	3.84	0.75		
	Bachelor	168	3.77	0.74		
	Postgraduate	20	3.19	1.13		

*Statistically significant at $p < 0.05$, degrees of freedom (df) = 353

Table 6 Means, standard deviations, and one-way ANOVA analysis of challenges facing Palestinian crime scene investigators according to years of service at CSI

Field	Years of service at CSI	N	Mean	Std.	F	(Sig)*
Challenges facing crime scene management	Less than 5	144	3.77	0.79	0.21	0.890
	From 5 to 10	78	3.77	0.80		
	From 11 to 15	64	3.70	0.85		
	More than 15	68	3.81	0.84		
Challenges facing technical procedures at crime scenes	Less than 5	144	3.78	0.76	0.14	0.937
	From 5 to 10	78	3.77	0.88		
	From 11 to 15	64	3.76	0.88		
	More than 15	68	3.84	0.88		
Challenges overall	Less than 5	144	3.78	0.74	0.17	0.914
	From 5 to 10	78	3.77	0.80		
	From 11 to 15	64	3.73	0.83		
	More than 15	68	3.82	0.82		

*Statistically significant at $p < 0.05$, degrees of freedom (df) = 353

Table 7 Means, standard deviations, and one-way ANOVA analysis of challenges facing Palestinian crime scene investigators according to rank

Field	Rank	N	Mean	Std.	F	(Sig)*
Challenges facing crime scene management	Noncommissioned officer	42	3.83	0.78	3.75	0.011
	From lieutenant to captain	189	3.86	0.76		
	Major and lieutenant colonel	106	3.64	0.84		
	Colonel and above	17	3.31	1.08		
Challenges facing technical procedures at crime scenes	Noncommissioned officer	42	3.91	0.76	4.20	0.006
	From lieutenant to captain	189	3.88	0.78		
	Major and lieutenant colonel	106	3.66	0.86		
	Colonel and above	17	3.26	1.08		
Challenges overall	Noncommissioned officer	42	3.86	0.75	4.30	0.005
	From lieutenant to captain	189	3.87	0.73		
	Major and lieutenant colonel	106	3.65	0.81		
	Colonel and above	17	3.29	1.05		

*Statistically significant at $p < 0.05$, degrees of freedom (df) = 353

Table 8 Means, standard deviations, and one-way ANOVA analysis of challenges facing Palestinian crime scene investigators according to department

Field	Department	N	Mean	Std.	F	(Sig)*
Challenges facing crime scene management	CRU	188	3.88	0.76	7.23	0.001
	First officer	110	3.75	0.75		
	CIU	56	3.42	1.01		
Challenges facing technical procedures at crime scenes	CRU	188	3.93	0.75	9.37	0.000
	First officer	110	3.73	0.79		
	CIU	56	3.41	1.03		
Challenges overall	CRU	188	3.90	0.71	8.87	0.000
	First officer	110	3.74	0.73		
	CIU	56	3.42	0.98		

*Statistically significant at $p < 0.05$, degrees of freedom (df) = 353

Table 9 Means, standard deviations, and one-way ANOVA analysis of challenges facing Palestinian crime scene investigators according to workplace district

Field	Workplace	N	Mean	Std.	F	(Sig)*
Challenges facing crime scene management	South	105	4.02	0.62	15.53	0.000
	North	115	3.87	0.75		
	Middle	134	3.48	0.91		
Challenges facing technical procedures at crime scenes	South	105	4.02	0.69	12.72	0.000
	North	115	3.89	0.77		
	Middle	134	3.52	0.91		
Challenges overall	South	105	4.02	0.60	15.74	0.000
	North	115	3.88	0.71		
	Middle	134	3.50	0.88		

*Statistically significant at $p < 0.05$, degrees of freedom (df) = 353

lowest mean of challenges (3.42) compared to first officers and CRU (Table 8).

It is clear from Table 9 that there is a significant difference ($P < 0.05$) among the averages of the responses according to the workplace variable. It was found that the mean of the Middle district (3.5) corresponds to fewer challenges compared to North and South districts (3.88; 4.02) respectively.

Discussion

The main purpose of this study is to highlight the management and technical challenges faced by PCP officers (i.e., CIU, CRU, and first officers) during their working in CSIs in Palestine. It is valuable to mention that forensic investigation completely depends upon the forensic evidence such as firearms, fingerprints, blood, saliva, and semen. The preservation, collection, and examination of these physical evidence related to a criminal case are named forensic investigation (Joseph 2022). During this study, the investigators were asked about the challenges they faced while protecting, searching, collecting, labeling, packaging, and analyzing of forensic evidence in a proficient way. In this context, the respondents were asked, whether or not these proceedings tracked appropriately by PCP investigators in the crime scene.

The distribution of participants according to the unit and district where they work is consistent with the real numbers of CSI officers in each district as shown in Table 1 and summarized here as north = 37.3%, middle = 42.0%, and south = 20.7%. Most of the officers working at the crime scene are males, which consistence the latest data from the survey conducted by the Palestinian Central Bureau of Statistics (PCBS) (2018). Regarding the academic level of CSI officers, most of them hold bachelor and intermediate diploma degrees. Compared to the Palestinian population, holders of a bachelor's degree in the PCP is high based on the PCBS (PCBS 2022a).

This is due to several reasons, including that the nature of work in the PCP agency requires a bachelor's degree from a police or security academy. In addition, a number of police employees have completed their university studies and obtained a bachelor's degree during their work in PCP agency. The results of this study also indicate that most officer ranks are from lieutenant to colonel (Table 2).

This distribution is mirroring that of officers in all Palestinian security forces (DCAF — Geneva Centre for Security Sector Governance 2007). The increase in the number of officers especially from lieutenant to captain is due to the PCP agency receiving, during the last 10 years, a large number of graduates from police and security academies (approximately 200/year). The PCP now recruits new officers from Al-Istiqlal University in Palestine, from the Police Academy in Egypt, and from other formation centers around the world.

To be acquainted with the types of ranks, their arrangement, and other administrative matters in the Palestinian security services, one should consult the Service in the Palestinian Security Forces Law No. 8 of 2005, which defines the terms of appointment, seniority, promotions, etc. for officers working in all security forces, including the PCP (DCAF — Geneva Centre for Security Sector Governance 2005).

Most participants (40.7%) had worked at the CSI for less than 5 years. These findings contradict the results of similar study conducted by Muthini (2018), who points that the number of crime scene workers in the directorate of criminal investigation in Kenya has more years of work. This is due to many officers in PCP were newly started working in CSI units, since the Palestinian forensic laboratories reestablished recently (2016).

Gender and years of service of PCP officers do not affect significantly the challenges they face, which can be explained by the fact that treatment, training, and

capabilities are available to both genders without discrimination. This result is in agreement with Bowen and Schneider (2014). Indeed, the General Department of Criminal Investigation attracts highly qualified and skilled people while providing specialized training programs to support them. Moreover, it is here noticed that the peer-to-peer process of training officers (i.e., gaining experience from their more experienced colleagues) is distinctive trait of the CSI department within the PCP. Indeed, work in the criminal investigation system is usually through groups rather than via individuals. Therefore, difficulties and challenges are faced by whole groups, with members whose years of experience usually vary, which can explain the homogeneity in assessing those challenges. Nevertheless, one should balance it with the fact that most (62.7%) of the officers working at the crime scene are working at the CSI for less than 10 years (Table 2).

Nevertheless, CSI officers holding intermediate or lower diploma are facing more challenges for crime scene management and for technical procedures at crime scenes. CSI officers who have studied for a year or 2 and who hold an intermediate diploma do not have sufficient scientific and management knowledge compared to those who completed postgraduate studies and which are facing less challenges in the crime scene. This is consistent with a previous study conducted in Kenya by Muthini (2018), who recommended that investigators require more education and specialized training. The majority of CSI employees possesses basic literacy but lack the advanced education required in their job as CSI officers. Being more educated, postgraduates tend to be more neutral toward these challenges. They also have higher ranks in PCP, and the nature of their work is generally administrative, which could downplay their criticism.

In 2022, the percentage distribution of Palestinians (15 years and over) by educational attainment in the West Bank was as follows: 20.9% had a secondary diploma, 5% had an intermediate diploma, and 17.5% had a bachelor degree or more based on the PCBS, while more than half of CSI officers possess at least a bachelor's degree (53.1%). In order to explain these ratios, the authors of this study conducted an interview with the administrative affairs at the PCP command, and it was found that those working in CSI are of two categories: the first is officers and noncommissioned officers who are graduates from police academies with a bachelor's degree or an intermediate diploma, while the second category consists of individuals who joined the police force through limited training courses, and most of them are at the secondary school level or less.

Compared to the general Palestinian population, PCP has a higher percentage of holders of a bachelor's degree.

This is due to several reasons, including that the nature of work in the PCP agency, especially in CIU and CRU, requires a bachelor's degree from a police or security academy. In addition, a number of police employees have completed their university studies and obtained a bachelor's degree during their work in PCP agency. Note that the administrative affairs in the PCP command do not object to the completion of higher university studies by working individuals but rather motivate them to do so. This led to a number of workers with high school degrees and intermediate diplomas to complete their university studies and obtain a bachelor's degree in order to improve their financial and moral status. However, most of the specializations obtained by police workers are far from the scientific field of CSIs. This is due to the scarcity of these majors in the local Palestinian universities. Therefore, the majority of PCP officers possess intermediate diploma but lack the advanced education required in light of the professional nature of their job duties as crime scene investigators.

Unsurprisingly, the Middle district seems to face less challenges than the two other ones, namely the South and North districts. We can explain this by the fact that the central governorate, especially Ramallah (Middle district), is considered the center of political and administrative decision-making, being the temporary capital of the State of Palestine. The general headquarter of the police command is in the city of Ramallah, which means the capabilities and tools are more available there. Although the knowledge of the problems and challenges by the higher administrative level in the PCP agency with regard to specific specializations working at the crime scene may be higher than in the provinces far from the center of decision-making, the Israeli occupation checkpoints between cities or police regions limit movement and shift of workers between governorates. PCP officers are generally serving in the nearest area from where they live.

The overall score for the challenges facing CSI officers came with an average of 3.78 with all paragraphs means at more than 3.5 (Table 3), which supports a high degree of challenges facing crime scene management and technical processes at crime scenes according to the respondents of this study. Such challenges are encountered during collection, transportation, and storage of forensic evidence and amplified or worsened by the Israeli occupation policy. These challenges are also reported in the literatures (Peterson et al. 2013; Hess et al. 2016; Houlden and Stevenson 2016). Results also show that the questions about the Israeli occupation represented by barriers, checkpoints, and many procedures related to the occupation's presence on the ground received the highest evaluation rate by PCP officers, which means that these are the main challenge they face.

A quick reminder regarding the Israeli occupation seems relevant, as it is many times invoked as a red thread, although it should not constitute an excuse for many of the challenges facing CSI in Palestine. Nevertheless, its barriers, checkpoints, settlements, and military operations constitute undoubtedly an unavoidable obstacle facing PCP officers to carry out their duties, especially crime investigators. This is done by preventing access to some areas and military checkpoints which hinders the work team from reaching the crime scene at the specified time. This leads to breaking the chain of custody, tampering with evidence, and wasting an unreasonable amount of time (Badiye et al. 2023). It also prohibits some officers from traveling abroad for CSI training. Add to it an Israeli ban to purchase some equipment and devices used on crime scenes and in forensic laboratories in Palestine, such as equipment for collecting, storing, and analyzing samples that contain DNA, and the realistic threat of destruction of the PCP headquarters and criminal laboratories, as happened in December 2001 in Gaza and April 2002 in Ramallah with the previous forensic Palestinian capacities built by the European Union (Crispino 2007).

Conclusions

The results of this study support that Palestinian crime scene investigators face several challenges regarding both crime scene management and technical procedures at crime scenes (i.e., reaching the crime scene, collecting and storing forensic evidence, shortage of equipment and tools, and training of CSI officers). According to the findings of this study, the most challenges facing the PCP officers were Israeli occupation and staff training. The perception of these challenges differs significantly depending on some of their demographic attributes (i.e., level of education, rank, working department/unit, and workplace district), while respondents' gender and length of service at the CSI did not significantly impact their vision of these challenges.

Many causes could explain these challenges, for example, overlapping responsibilities and ranks between officers or coordination between specialized agencies working at the crime scene. Some of these challenges are common with other countries outside Palestine; hence, it could seem that abroad solutions could be adopted. But according to this study, the main factor explaining many, if not all, of the impeding challenges faced by Palestinian police officers working at crime scenes is linked to the Israeli occupation. This study has some limitations. This study did not include PCP from Gaza strip due to the wars there, which hindered comparisons with different regions in all Palestinian governorates, while this could be an interesting extension of this study that might warrant more exploration. Further studies are needed to

better understand the consequences of other factors (e.g., ranks distribution between officers, lack of coordination between specialized agencies during crime scene management, and evidence interpretation). Hopefully, this study will help PCP decision-makers to prioritize which numerous challenges to work on to support workers at crime scenes. At this stage, the study emphasizes the need for improvements in training programs along with the provision of necessary tools and devices. Besides, the authors suggest that policymakers and the government in Palestine raise awareness of the obstacles faced by crime scene workers due to the Israeli occupation in international forums. By doing so, they could seek support and assistance to find viable solutions to this ubiquitous problem.

Authors of this study recommend in this field of future studies to improving the study tool to be more specific by asking about types of equipment are in need; such as; evidence collection or processing kits; scene search or field-testing equipment. Furthermore, it also important to indicate what types of courses and trainings are in need.

Abbreviations

CSI	Crime scene investigation
CIU	Criminal Investigations Unit
CRU	Criminal Research Unit
PCP	Palestinian Civil Police

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s41935-024-00386-1>.

Additional file 1: Appendix 1. Study tool (Questionnaire).

Acknowledgements

This research is conducted under the Palestinian Quebecer Science Bridge (PQSB), which promotes scientific collaboration in research between Quebec, Canada, and Palestine through the Palestine Academy for Science and Technology and the Fonds de Recherche du Quebec (FRQ), Canada, and its three branches; the Fonds de recherche du Quebec — Sante (FRQS), the Fonds de recherche du Quebec — Nature et technologies (FRQNT), and the Fonds de recherche du Quebec — Societe et culture (FRQSC).

Authors' contributions

WMK, conceptualized and designed the study methodology, results interpretation and discussion, drafting the work or reviewing it critically, and read and approved the final manuscript. AALR, designed the study methodology, literature review, analyses, and data curation. SR, formal analyses, interpreted the data and drafting the work, or reviewing it critically. MA, formal analyses and interpreted the data, proofreading, and drafting the work or reviewing it critically. FC, review and editing, literature review, discussion and interpretation of the results, and read and approved the final manuscript.

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Funding

No funding.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Received: 12 August 2023 Accepted: 16 January 2024

Published online: 03 February 2024

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