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ORIGINAL ARTICLE

Association between Nurse Compliance and workload regarding Patient Safety: A cross-sectional study

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ABSTRACT
Patient safety is a serious universal issue. Studies show that in developed countries, one in ten patients is harmed during hospital care. The link between patient safety and nursing workload is one of the most enduring health concerns, requiring resource mobilization by WHO and nursing organizations around the world. Nurses play an important role in assurance, advocacy and quality initiatives in clinical settings. The aim of the study was to determine the relationship between nursing staff compliance and clinical workload in terms of patient safety. A cross-sectional study conducted on 275 nurses from 4 public teaching hospitals via convenience sampling techniques. The sample size estimated and calculate via Slovin's Formula. A set of previous studies tools via self-administration using 5 points Likert scale questions. Among 275 nurses 269 nurses return back with response rate 97.8% considering 20% dropout rate. We're excluding Five samples due to incomplete data. 264 nurses were included and analyzed. More than half nurses were poor compliance 191(72%), and low workload 157(59%). The mean age of the nurses were 35.92 ± 9.82 years old, the majority of age groups was < 29 yrs. (32%), female more than male (67%), (32%). The result shows statistically significant positive relationship between nurses' compliance and clinical workload, (r = 0.0316, p = 0.0037 two-tailed). The findings indicate that the majority nurses have poor compliance about patient's safety, may some factors relate to nursing practice such as (shortage nurses, workload, and nurse-patients ratio). Nurse educators and managers ought to concentrate on heightening awareness regarding perception of patient safety. Also. play a vital role in delivering and establishing comprehensive programs that enable newly graduated nurses to make a smooth transition into professional practice, enhance standard precautions adherence, and promote patients' safety in various healthcare circumstances.
Keywords; *Nurses' compliance, Patient Safety, Clinical, Workload, Cross-Sectional design*

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INTRODUCTION

Patient safety is a critical aspect of healthcare delivery, with a direct impact on patient outcomes and quality of care(1). Nurses play a pivotal role in ensuring patient safety by adhering to established protocols, guidelines, and best practices(2). One key factor that may influence nurse adherence to these standards is their workload(3). Workload, defined as the demands and responsibilities placed on nurses, can encompass patient care tasks, administrative duties, and communication responsibilities, can significantly impact their ability to provide safe care(4). Understanding the association between nurse compliance and workload is essential for optimizing patient safety and healthcare quality(5).

Patient safety is a paramount concern within healthcare systems worldwide(6). Ensuring safe and effective patient care is a multifaceted endeavor that relies on numerous factors, including the diligent adherence of healthcare professionals to established guidelines, protocols, and best practices(7). Nurses, as integral members of healthcare teams, play a pivotal role in upholding patient safety(8). Their compliance with clinical protocols and safety measures is crucial for preventing errors, reducing adverse events, and improving overall healthcare quality(9). However, this compliance can be influenced by various factors,

with workload emerging as a central consideration in this complex relationship(10). Nurses often find themselves balancing a range of clinical, administrative, and communication responsibilities, which can lead to varying degrees of cognitive, emotional, and physical strain(11). These demands can potentially hinder their capacity to fully adhere to recommended protocols, potentially compromising patient safety. The association between nurse compliance and workload is of paramount importance due to its potential implications for patient outcomes and healthcare quality. (12). Understanding the nuances of this relationship through empirical investigation is crucial for designing targeted interventions that optimize patient safety while also ensuring the well-being of healthcare professionals(13).

Patient safety is an essential component of healthcare quality and involves preventing harm to patients during the course of medical treatment and care. Adherence to evidence-based clinical guidelines and protocols is a cornerstone of patient safety efforts(14). Nurses, as frontline caregivers, are entrusted with the responsibility of executing these guidelines accurately and consistently. Their compliance with protocols related to medication administration, infection control, hand hygiene, and communication has a direct impact on preventing adverse events and promoting patient well-being(15).

Several studies have underscored the importance of nurse compliance in patient safety outcomes(16). A cross-sectional study by Cho. demonstrated a positive association between nurse adherence to care protocols and decreased patient mortality rates(17). The study found that increased nurse compliance with infection control protocols led to reduced hospital-acquired infections, thereby highlighting the direct link between adherence and patient safety outcomes(18). Nurse workload is a multidimensional construct that encompasses various dimensions of nursing practice, these dimensions include patient care tasks, administrative responsibilities, documentation demands, and communication requirements, workload can be categorized into quantitative measures, such as patient-to-nurse ratios, and qualitative aspects, such as the cognitive and emotional demands of nursing practice(19).

Quantitative measures of workload have been extensively explored in the literature. Studies have examined the impact of high patient-to-nurse ratios on patient safety outcomes(20). For instance, Quinn. conducted a seminal study that demonstrated a significant correlation between nurse staffing levels and patient mortality rates(21). Hospitals with lower nurse-to-patient ratios exhibited higher mortality rates, emphasizing the role of nurse workload in patient safety(22). Qualitative aspects of workload, including cognitive and emotional demands, are equally important(23). Nursing practice requires constant decision-making, critical thinking, and multitasking, the cognitive load imposed by these demands can influence nurses' ability to prioritize tasks and adhere to safety protocols(24). Furthermore, emotional demands, such as managing patient and family expectations alongside clinical responsibilities, can contribute to overall workload and impact compliance with safety guidelines(25) .

The relationship between nurse compliance and workload is complex and bidirectional(26). Elevated workload can create challenges that impede nurse compliance with established protocols, subsequently affecting patient safety. As workload increases, nurses may experience fatigue, stress, and time constraints, which can lead to shortcuts in adherence to safety guidelines. (27). This compromise in adherence heightens the risk of errors, adverse events, and compromised patient safety. Empirical evidence supports the notion that high workload can negatively impact nurse compliance and patient safety. The study found that inadequate staffing increased the likelihood of medication errors, falls, and hospital-acquired infections, reinforcing the link between workload and patient safety outcomes.(28). A study by Stalpers. conducted a meta-analysis of nurse staffing levels and patient outcomes, revealing a clear association between reduced nurse staffing and adverse patient events(29).

Several theoretical frameworks offer insights into the complex interplay between nurse compliance, workload, and patient safety(30). The Job Demand-Control-Support model (Karasek, 1979) posits that high job demands and low decision-making control can lead to stress and reduced job satisfaction(31). In the context of nursing, this model suggests that high workload coupled with limited autonomy could hinder compliance with safety guidelines and compromise patient safety(32). The Effort-Reward Imbalance model (Siegrist, 1996) suggests that when the effort invested in a job is not adequately rewarded, individuals may experience stress and reduced motivation. Applied to nursing, this model implies that nurses facing high workload without corresponding recognition or support may be less motivated to strictly adhere to safety protocols(33).

While the theoretical underpinnings provide insights, empirical research exploring the direct association between nurse compliance and workload regarding patient safety is limited. The existing literature often presents a fragmented view of this relationship, with studies focusing on either nurse compliance or workload without adequately considering their interconnectedness(34). A cross-sectional study design is well-suited to examine this relationship within a specific timeframe, capturing data on nurse compliance, workload, and patient safety outcomes simultaneously. By assessing these variables collectively,

researchers can gain a comprehensive understanding of how workload impacts nurse compliance and, subsequently, patient safety. Such insights can guide healthcare organizations in formulating targeted strategies to optimize workload management and improve nurse compliance with safety protocols(35).

MATERIAL AND METHODS

Study design, setting, Participants and procedure

A quantitative cross-sectional study, descriptive was carried out to find the association between nurses compliance and clinical workload regarding patient safety in public hospitals.

In this study the researcher conducted on 275 nurses who are working in clinical areas recruitment by convenience sampling technique. the sample size was estimated on the total numbers of nurses approximately 641 and upon on the last census was done in 2021-2022, from Azadi Teaching Hospital ATH; N=216(n=83), Heevi Pediatric Teaching Hospital HPTH; N=110(n=42), Emergency Teaching Hospital ETH; N=184(n=71), Maternity Teaching Hospital MTH; N=131(n=50). A set of questionnaires from previous studies was adopted and modified to assess the relationship between nurse compliance and clinical workload by self-report questionnaire and considering 20% dropout rate. Among 275 nurses 269 questionnaires return back with response rate 97.8%. Five nurses excluding because incomplete information. the researcher used 5 points Likert scale types questionnaires. Therefore, finally the 264 questionnaires included and analyzed.

The data collection of the study started from 1st April 2022 until the end of September 2022 every daytime of the week from Saturday to Friday from nurses during morning and evening working shifts from 09:00 am. - 17:00 pm. Via self-administration and face-to-face interview with nurses in clinical areas. The whole duration of the study from 1st November 2021 to the end of November 2023. The sample size was estimated and calculated using the general population size of nurses with setting a limited to 5% of margin of error, confidence level of 95% as suggested by Ngulube (36) , this means that there are 95 chances in 100 or (0.95 in 1) that the sample results represent the true condition of the population within a specified precision range against 5 chances in 100 (or .05 in 1) that it does not. The sample size was estimated and calculated via Slovin's Formula as follow; $(n = N / 1 + Ne2) = (n = sample\ size, N = Total\ population, e = Error\ tolerance).$

$$\{n= N/1 + Ne2 \quad || \quad 641/1+641(0.05)2 = 641/2.602= 246.3{\sim}246 \quad || \quad n= 246\}$$

This study was directed by the following research questions: firstly; What is the socio-demographic characteristics and work-related characteristics of the study samples? Secondly; is there any relationship between nurse compliance and clinical workload regarding patient safety in public hospitals?

The inclusion criteria, the nurses who have >1 year working in clinical areas, actively conducting patient safety management, and who willing to participation in the study, while excluding the nurses who did not providing health care services directly to patient's or have a little physical contact with patients care, nurses who have mild or any degree of psychiatric disorder and nurses who are rejected or refused to participation in the study. Each participant was asked for their willingness to participant in the study and if they reject to participate, then the next participant with same procedure via verbal permission, then requested to sign on the informed consent verification form of inclusion and exclusion criteria of the participant. However, the essential instructions and information about how to fill-up the instrument or questionnaire for each section of the questionnaire was given to participants, the questionnaires were distributed based on a voluntary basis at in the four teaching hospitals. the time for data collected form each participant take about 15 - 20 minutes that we estimated to ensure that participant have enough time to answer all questions in private area independently and mostly the researcher try to collecting data from nurses by making a small group and then give them time or chance to asked or clarify meaning of some unclear questions or words for them.

Research Instruments and Measures

A set of survey questionnaire distributed by the researcher via self-administration on the participants, using open and close-ended questions, the questionnaire consists of 33 items that are divided into 3 parts;

Part A**;** Nurses' socio-demographic characteristics, which is consisted of 13 items including; (age, gender, marital status, educational level, monthly income, and work-related characteristics, which is consisted of work place safety climate, work experience in nursing practices. working area or place. area of practice (clinical department). working hours per week. have you had any training on standard adherence precaution regarding patient safety. secondary or extra job, and nurses shift pattern. Part B; Nurses' compliance related patients' safety managements, that are using some items from a few previous study tools such as Compliance with Standard Precaution Scale-CSPS after adapted and modified the instrument and consists of 15-items that are divided on two sections (hand washing and hand hygiene - consist of 9 items and personal protective equipment PPE - consist of 6 items), were ranging questions answers from 1 to 5. The five attributes of the questions were rated on a 5-Likert scale approaches (1 = "strongly disagree", 2 = "disagree", 3 = "natural", 4 = "agree" and 5 = "strongly agree"). Each Likert scale item was rated from 1 (strongly disagree) to 5 (strongly agree). The total scores ranged from 28 – 67 depending on the results and a higher score indicating signified higher level nurse compliance concerning of the patient's safety. in this study, the

Cronbach's α coefficient was 0.72. Part C; Nurses clinical workload regarding patient safety management, that are adapted and modified from a few previous study tools used to assess nurse's clinical workload concerning of the patient's safety. we're ranging questions answers from 1 to 5. The five attributes of the questions were rated on a 5-Likert scale (1 = "Not at all", 2 = "Sometimes", 3 = "Regularly", 4 = "Often" and 5 = "All the time"). Each Likert scale item was rated from from 1 (Not at all) to 5 (All the time). The total scores ranged from 8 - 25 depending on the results and a higher score indicating signified higher level of nurse's workload of patient safety, in this study, the Cronbach's α was 0.67.

Ethical Approval and Consideration

This study was approved by Medical Research Ethics Committee - MREC under references number (24102021-10-17 R1) in 24th October 2021 and the research conducted in four main public teaching hospitals in Duhok province. However, this study was carried out in full compliance with the guidelines of good clinical practice of the world assembly declaration of Helsinki and was approved by the Medical Research Ethical Committee in Directorate of General Health-Duhok- DoGH.

Statistical Analysis Procedure

The researcher makes data management as an essential component and elements that lead to a significant result with less mistake and error. It is very important to understand the deferent type of data so that they can be described and presented in an appropriate manner, in this study, the researcher was coded the data set to maintain confidentiality for all participant or patients. Summative score of the instruments was entered as a continuous measure. All the data were entry, computed, analyzed and cleaned with double checked for normality distribution by researcher using JMP statistical software version 16. Firstly, a descriptive statistical analysis was conducted to generate descriptive statistics to analyze for frequencies, means, standard deviations and percentages for calculating continuous quantitative variables. The results were reported using descriptive statistics such as frequency tables, graphs, bar charts, histograms, and pie charts for categorical variables. Secondly, inferential statistical analysis was use for the categorical variables parametric test use for the data normally distribution, if not normally distribution will use nonparametric test will used. A $p < 0.05$ will consider significant values

As the validity and reliability is very important aspects of the research process, as this gives the research findings their credibility (37). The Researcher was assessed and tested the validity of the questionnaire for English language to ensure the wording is correct and clear the meaning of the sentences and easily understandable for the participants. These instruments were distributed on nurses from main four public teaching hospitals prior to data collection to clarity of instructions of the questionnaire for pilot tested. However, in order to achieve its objectives without affecting the validity of questionnaires,

The content validity of the questionnaire was check and assessing by a penal of >35 expertise to ensure and based on the objectives? and the questionnaire was able to measure? what is purposed to measure pre-piloted test? However, from different Iraqi province universities academic staff was participated in validate tools such as college of nursing, college of medicine teachings staff and nurses who have an experience in academic educational in these areas to ensure the content validity of these instruments. the questionnaire was found to comprehend the necessary essentials for an accurate to examine the correlation between nurses' compliances and clinical workload concerning patient safety in public hospitals. Then the developing questionnaire content validity were evaluated by ten nurses' with >10 years working experiences in clinical areas, postgraduate degrees the language, comprehension aspects of the questionnaires were evaluated during and after questionnaire administration of instrument and verify understanding and cultural congruence as well as to evaluate content validity. Some of participants give me a valuable significance comments, suggestions and recommendations to be easier, useful and understandable to the participants, none of the participants had problems answering the items on questionnaires papers. Moreover, the questionnaire was reviewed by supervisor.

The questionnaire was piloted among 10 nurses from clinical areas to identify the reliability after get official research ethical approval. Furthermore, based on the results of pilot study the questionnaire items were improved and the final version were corrected and modified, which ready for starting data collection, then a copy of questionnaire version distributed on a group of nurses to answer questions and test their experiences if it's difficulty or easy to understanding the questionnaire contents as a guide for assessing nurses who are required further explanation of the questionnaire's items.

The nurses were informed that their participation is not voluntary and they can any refuse and withdrawal in any step of pilot study and for any reason. Therefore. The participate were asked to give a written notes, comments, and suggestion about questionnaire context and contents to collect more ideas and comments about questionnaire understandability, length of questions, and language using in writing questionnaires contents and so on. Furthermore, it is worth to say that, these Participant in pilot study were excluded from the actual study. The internal consistency of the nurses' compliance evaluated using Cronbach's α coefficient was 0.720 in and clinical workloads was 0.673 in this study.

RESULTS AND DISCUSSION

In this study descriptive statistics analysis methods used to assess the socio-demographic and workplace related rates characteristics such as distribution of frequencies of variables, percentage, means and standard deviation, while inferential statistical analysis used to assess is there any relationships between the two continuous variables underlying the study, nurse's compliance and clinical workload score among nurses in public hospitals, such as scatterplot was used prior to observe the present of pattern of linear relationship between the two continuous variables, nurse's compliance and clinical workload score. In order to identify the relationship Bivariate correlations -Pearson test was used as its recommended to understand the association between nurse's compliance and clinical workload concerning the patient's safety in public hospitals.

General Characteristics of Nurses

Table (1) shows that the characteristic of the sample according to the socio-demographic data and work-related characteristics, the mean age of the nurses was 35.92 ± 9.82 years old, the minimum and maximum of age (21 & 59), the majority of age groups was < 29 yrs. 86 (32.58) in compare to less age groups 40 - 49 yrs. Was 37(21.59), the majority 178 (67.42) of participant nurses were female, 86 (32.58) were male. The more than of half 177 (67.05) of marital status of samples was married with only 87(32.95) of samples was single, the common of educational level had an institution nursing degree (2 yrs.)106(40.15) in compare to less baccalaureate nursing degree (4 yrs.) Level 54(20.45), the majority of nurses with low <1.000.000 IQD. Monthly incomes were 193(73.11) while the more than >1.000.000 IQD. Monthly incomes were 71(26.89).

Related work-related characteristics nurses the most of nurses was satisfactory 160(60.61) with their work place safety climate in compare of that unsatisfactory 104(39.39). The mean work experience in nursing practices (years) of the nurses was 13.71 ± 10.84 years; the mean of the work experience in nursing practices was 13.71 ± 10.84, the majority of work experience in nursing practices groups of the nurses was < 5 yrs. 74(28.03) in compare to less age groups 21 - 30 yrs. 30(11.36). The working area or place, the majority was staff nurse 204(77.27) then come charge nurse 54(20.45), while only 6(2.27) were head nurses in public hospitals. Related to area of practice (clinical department) of nurses were the mostly from different or others areas about 92(34.85), as followed by surgical ward 59(22.35), intensive care unit 49(18.56), medical ward 41(15.53), while lastly 23(8.71) participant were from emergency department. The mean of working hours per week (including overtimes) of the nurses was 37.98 ± 6.03 (hrs./wks.); the majority of working groups of the nurses was 185(70.08) of working groups < 42 hrs. / wks. In compare to less 42 hrs. / wks. Groups were 79(29.92). Related to nurses if they had any training on standard adherence precaution regarding patient safety, the majority of nurses 180(68.18) were answer (yes), it means that they had participate in training courses, in compere to nurses that they answer by (no) 84(31.82). Related to nurses if they have a secondary or extra job, they mostly working one job or only public hospital around 192(72.73) and follow private hospital about 51(19.32), then in private clinic 13(4.92) and lastly as they have second job was assistant pharmacist 8(3.03). In concerning to nurse's shift pattern, the majority of nurses have only one shift which is about 177(67.05) and only 87(32.95) of nurses where they have working more than two shifts.

Table 1: Socio-demographics and work-related characteristics among nurses at the baseline (n=264)

Variables	Categories	Frequency Distributions n (%)	Mean ± Std. Dev.*
Age Groups (years)	< 29 Yrs. 30 - 39 Yrs. 40 - 49 Yrs. > 49 Yrs.	86(32.58) 57(31.82) 37(21.59) 84(14.02)	35.92 ± 9.82
Gender	Male Females	86(32.58) 178(67.42)	
Marital statuses	Single Married	87(32.95) 177(67.05)	
Educational levels	Secondary Nursing (3 Yrs.) Institutions Nursing (2 Yrs.) Baccalaureate Nursing (4 Yrs.)	104(39.39) 106(40.15) 54(20.45)	
Monthly incomes	<1.000.000 IQD. >1.000.000 IQD.	193(73.11) 71(26.89)	
Work place safety	Satisfactory Unsatisfactory	160(60.61) 104(39.39)	

Variables	Categories	Frequency Distributions n (%)	Mean ± Std. Dev.*
Work experience in nursing practices groups (years)	< 5 Yrs. 6 - 10 Yrs. 11 - 20 Yrs. 21 - 30 Yrs. > 30 Yrs.	74(28.03) 72(27.27) 55(20.83) 30(11.36) 33(12.50)	13.71 ± 10.84
Working areas (places)	Staff Nurse Charge Nurse Head Nurses	204(77.27) 54(20.45) 6(2.27)	
Area of practice (Clinical Department)	Medical ward Surgical ward Intensive care unit Emergency department Others*	41(15.53) 59(22.35) 49(18.56) 23(8.71) 92(34.85)	
Working (Hrs./Wks.) (Including overtimes) Groups	< 42 Hrs. / Wks. > 42 Hrs. / Wks.	185(70.08) 79(29.92)	37.98 ± 6.03
Training courses R/L standard precaution & patient safety	Yes No	180(68.18) 84(31.82)	
Secondary job (Extra)	Public Hospital Private Hospital Private Clinic Assistant Pharmacist	192(72.73) 51(19.32) 13(4.92) 8(3.03)	
Nurses Shift pattern	One shift >Two shifts	177(67.05) 87(32.95)	
Note/ N = 264; Std. Dev.* = *Standard Deviation****; Others* =*** *Orthopaedics wards, Neurosurgery wards, Oncology wards, Delivery Rooms, Premature babies' unit, Vaccinations & COVID-19-unit, Minor surgery's, Paediatric - Red Room, Patients Reception Dept., Infections Control and Cardiac Catheterization Dept.*			

Table (2) the result shows the mean of the nurse compliances 49.45 ± 8.52 among nurses at the baseline (n=264). related to the hand washing and hand hygiene the weighted average was (3.58%), which is calculated by sum of all means divided on the numbers of items as follows in this formula; (32.27 / 9 = 3.58%). the mean and standard deviation 30.72 ± 6.09; the scores ranging from 9 – 44, the confidence interval 95%, 29.989 to 31.465, while the nurse compliance relates to use of personal protective equipment-PPE. was (3.53%), (21.22 / 6 = 3.53%). the mean and standard deviation was 18.76 ± 4.23, the scores ranging score 6 – 30, the confidence interval 95%, 18.165 to 19.190. The data analysis shows that the majority of the respondents appeared that they have high compliances or adherence to do as scientific hand washing with using a type aseptic or liquid soap when they wash their hand by available cleaners with water not only water as the mostly answers strongly agree to wash with using soaps to prevent transferring microorganisms between patients, (*Wash hands using tap water only? **), related to do directly hand washing after each procedure and mostly answers they do handwashing directly because of the gloves powder (*wash hands immediately after removal of gloves?*), related to nurses subsequently contact the patients during providing health care services they do hand washing as appeared from their answers,(*Wash hands after touching a patient?*), about the the using distributors hand hygiene most of them say if available in the word or locations of working they do alcohol-based rubbing when they finish any procedures (*Wash hands or hygiene by alcohols-based rubbing or dispensers*?), near-by to nurse exposed to patients body fluids as they answer they acting hand washing at the end,(*Wash hands after body fluid exposure?*), when they contact and worked around the patients surround they do hand washing in this stations as the result shows. (*Wash hands after touching patient surroundings?*).

On other hand, the participants appeared that they have low compliances to do hand washing prior contacting the clients for any performance they very rare do hand washing as show from the result, (*Wash hands before touching a patient?*), about the hand washing prior aseptic technique or procedures they do not wash their hands as much as needed during provide health care services for patients, (*Wash hands before clean or aseptic procedures?*), nearby I ask them about the standard or typical time taking for their

hand washing procedure most of them they low compliance or adherence or they don't taking in consideration about this scientific handwashing or hand hygiene, (*(Wash hands for 20 seconds duration?).*

(Table 2) Nurses compliances rate among nurses at the baseline (n=264)

Questions	Frequency Distributions - n (%) *					Mean ±Std. Dev.**	Decisions***
	SD. (%)	D. (%)	N. (%)	A. (%)	SA. (%)		
Hand Washing and Hand Hygiene							
Wash hands using tap water only*	24 (9.09)	39 (14.77)	28 (10.61)	57 (21.59)	116 (43.94)	3.77 ±1.38	High Compliances
Wash hands immediately after removal of gloves	16 (6.06)	32 (12.12)	44 (16.67)	107 (40.53)	65 (24.62)	3.66 ±1.15	
Wash hands after touching a patient	21 (7.95)	17 (6.44)	41 (15.53)	113 (42.80)	72 (27.27)	3.75 ±1.15	
Wash hands or hygiene by alcohols-based rubbing or dispensers	16 (6.06)	12 (4.55)	26 (9.85)	116 (43.94)	94 (35.61)	3.98 ±1.08	
Wash hands after body fluid exposure	15 (5.68)	13 (4.92)	19 (7.20)	91 (34.47)	126 (47.73)	4.14 ±1.11	
Wash hands after touching patient surroundings	22 (8.33)	26 (9.85)	48 (18.18)	90 (34.09)	78 (29.55)	3.67 ±1.23	
Wash hands before touching a patient	55 (20.83)	65 (24.62)	58 (21.97)	54 (20.45)	32 (12.12)	2.78 ±1.31	Poor Compliances
Wash hands before clean or aseptic procedures	34 (12.88)	38 (14.39)	36 (13.64)	99 (37.50)	57 (21.59)	3.41 ±1.31	
Wash hands for 20 seconds duration	41 (15.53)	47 (17.80)	60 (22.73)	74 (28.03)	42 (15.91)	3.11 ±1.30	
Hand Washing and Hand Hygiene 30.72 ± 6.09**; **Average Rate:** 3.58%							
Note/ N = 264; n (%) * = *Frequency & Percentage**; Mean ± Std. Dev.*** *= Standard Deviation; Questions arranged depend on high compliances and Poor compliances;* ***SD.****= Strongly Disagree,* ***D.****= Disagree,* ***N.****= Neutral,* ***A.****= Agree,* ***SA.*** *= Strongly Agree; Questions with (**Sign***)* *scale items were arranged from the highest to lowest nurses' compliances rate - reverse scored items.;* ***Decision*** =** *Weighted Average = 32.27 / 9 = 3.58%*							
Personal Protective Equipment-PPE							
My mouth and nose are covered when I wear a mask	14 (5.30)	19 (7.20)	26 (9.85)	102 (38.64)	103 (39.02)	3.99 ±1.12	High Compliances
I sterilize all reusable equipment before being used on another patient	24 (9.09)	26 (9.85)	23 (8.71)	90 (34.09)	101 (38.26)	3.83 ±1.28	
I wear waterproof gown, gloves, when I am exposed to body fluids, blood products, or any patient's excretions	41 (15.53)	26 (9.85)	34 (12.88)	89 (33.71)	74 (28.03)	3.49 ±1.39	
I reuse mask or disposable Personal Protective Equipment *	11 (4.17)	20 (7.58)	22 (8.33)	46 (17.42)	165 (62.50)	4.27 ±1.14	
I remove Personal Protective Equipment in a designated area	57 (21.59)	49 (18.56)	29 (10.98)	65 (24.62)	64 (24.24)	3.11 ±1.50	Poor Compliances
I wear a surgical mask alone or in combination with goggles, face shield, and apron whenever there is a possibility of a splash or splatter.	96 (36.36)	51 (19.32)	37 (14.02)	42 (15.91)	38 (14.39)	2.53 ±1.47	
Personal Protective Equipment 18.67 ± 4.23**; **Average Rate:** 3.53%							
Note/ N = 264; n (%) * = *Frequency & Percentage**; Mean ± Std. Dev.*** *= Standard Deviation; Questions arranged depend on high compliances and Poor compliances;* ***SD.****= Strongly Disagree,* ***D.****= Disagree,* ***N.****= Neutral,* ***A.****= Agree,* ***SA.*** *= Strongly Agree; Questions with (**Sign***)* *scale items were arranged from the highest to lowest nurses' compliances rate - reverse scored items.;* ***Decision*** =** *Weighted Average = 21.22 / 6 = 3.53%*							

Table (3) The result shows the mean and standard deviation of the clinical workload was 16.45 ± 3.54 among nurses at the baseline (n=264), the weighted average rate was (3.28%), which is calculated by sum of all means divided on the numbers of items as follows in this formula; (16.44 / 5 = 3.28 %)., the scores ranging 8 - 25, The data analysis shows that the majority of the respondents appeared that they have too much achievement or duty to do in their unit and they answers appear that they have high workload in their setting in the hospital (*Do you have too much work to do in your clinical area?*). furthermore, the result displays that majority of the participant nurses have high level of workload with using their abilities and capabilities to thinking critical and mentally challenges during daily work in their clinical areas in the hospital. (*Do you consider your work mentally very challenging in your clinical area?*). Also, the analysis

illustrated that the majority of the nurse's answers to these questions looked they filling with fully physically energetic with high level of workload during applying and achieving their obligation in their departments (*Do you find your work in your clinical area?*).

On the other hand. The result shows that the nurses had low workload when the researcher ask them about working very fast or quickly during applying procedures such as dressing, injections, urinary catheterization for example they answers was of courses a very rare or no acceptable and will be an ethically issues with ignoring the rules, rights, policies and code of issues in these situations. (*Do you have to work very fast in your clinical area?*). also, when asking them about if you claim and emotionally work in their areas, they looked from their answers this professional as nursing need and required from us to do our job quietly, respect, professionally even we are in high workload because we look, deals and take patients health in consideration without any culture or differences all same in providing health care services. (*Do you work claims and a lot from you emotionally in your clinical area?*)

Table (3) Workload Scale characteristics among nurses at the baseline (n=264)

Questions	Frequency Distributions - n (%) *					Mean ± Std. Dev.**	Decision***
	NAA. (%)	ST. (%)	R. (%)	O. (%)	ATT. (%)		
Do you find your work physically energetic in your clinical area?	39 (14.77)	44 (16.67)	33 (12.50)	61 (23.11)	87 (32.95)	3.43 ±1.46	High Workloads
Do you have too much work to do in your clinical area?	71 (26.89)	82 (31.06)	51 (19.32)	45 (17.05)	15 (5.68)	3.56 ±1.21	
Do you consider your work mentally very challenging in your clinical area?	15(5.68)	35(13.26)	49(18.56)	79(29.92)	86(32.58)	3.70 ±1.21	
Do you work claims and a lot from you emotionally in your clinical area?	34 (12.88)	44 (16.67)	55 (20.83)	78 (29.55)	53 (20.08)	3.27 ±1.30	Low Workloads
Do you have to work very fast in your clinical area?	58 (21.97)	92 (34.85)	63 (23.86)	31 (11.74)	20 (7.58)	2.48 ±1.17	
Mean ± Std. Dev. 16.45 ± 3.54; **Average rate:** 3.28 %							

Note/ N = 264*; *n (%) * =** Frequency & Percentage; **Mean ± Std. Dev.* = Standard Deviation.; Questions arranged depend on high workloads and low workloads; **NAA.** = Not at all, **ST.** = Sometime, **R.** = Regularly, **O.** = Often, **ATT.** = All the time; **Decision*****; Weighted average = 16.44 / 5 = 3.28 %*

Relationship between nurse compliance and clinical workload among nurses at the baseline (n=264)

To identify the relationship between the two continuous variables underlying the study, scatterplot was used prior to observe the present of pattern of linear relationship between the two continuous variables, nurse's compliance and clinical workload score among nurses in public hospitals. The result of the research illustrated that there is a positive association between nurse's compliance and clinical workload score among nurses in public hospitals. The linear fit of the nurse compliances scale = 42.4175+ 0.4277 workload scale score, the orthogonal fit ratio=5.784, and the bivariate normal ellipse p=0.950 (0.0037). as show in (**Figure 1**).

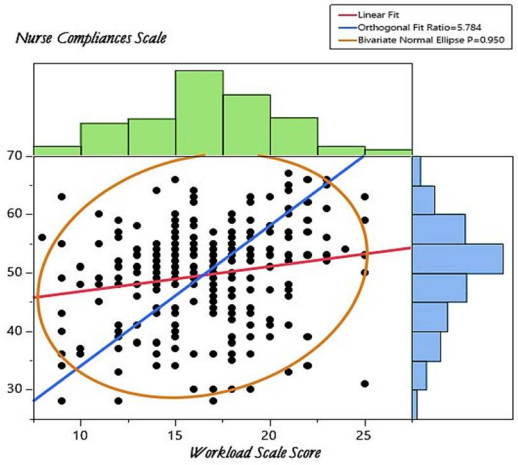

Figure (1) Scatterplots relationship between nurses' compliance and clinical workload at the baseline (n=264)

A positive statistically significant relationship was found between nurses' compliance and clinical workload variables, the r-value score was (r = 0.0316), which is less than 3, the p = 0.0037 (two-tailed). The mean of the nurses' compliance score was 49.45 ± 8.52, the minimum and maximum (28 & 67), the goodness-of-fit test-Shapiro-wilk (<0.0001) and Anderson-darling (<0.0001), were the confidence intervals 95% (48.421 to 50.487), the nurses' compliance score (1 – 5), the t-test statistic hypothesis value (<0.0001), therefore, the sum scales range (28 - 67) and compliance divided into group (28 - 45) (<45) are considered as poor compliance 191(72.34), and (45 – 67) (>45) are considered as good compliance 73 (27.65). While the mean workload scale score of the nurses was 16.45 ± 3.54, the minimum and maximum (8 & 25), the goodness-of-fit test-Shapiro-wilk (0.0172) and Anderson-darling (0.0092), were the confidence intervals 95% (0.108 to 0.337), the workload scale score (1 – 5), the t-test statistic hypothesis value (<0.0001). the clinical workload sum score ranges (8 - 25) and divided into groups (8 – 17) (<17) are considered as low workload scale 157(59.46), and (17 – 25) (>17) are considered as high workload scale 107(40.53). The test of probability >chi-square Pearson 0.0012.

The study conducted provides a comprehensive overview of the socio-demographic and work-related characteristics of the sampled nurses, offering valuable insights into the composition of the nursing workforce and potential factors that could influence nurse compliance and patient safety. The following findings discussion elaborates on the presented characteristics and their significance within the context of healthcare and patient safety.

The mean age of the nurses, 35.92 years, reflects a workforce with a significant range of experience. The diversity in age is important, as it implies a blend of seasoned professionals and younger practitioners who may bring fresh perspectives to patient care practices(38). About the gender, the higher representation of females (67.42%) aligns with global trends in nursing. This distribution reinforces the need for gender-sensitive strategies to address challenges related to workload, job satisfaction, and patient safety among nursing professionals(39). In circumstance. the marital status and educational levels, the fact that more than half of the participants were married and that a significant proportion had an institution nursing degree (40.15%) suggests that many nurses in the study might have familial responsibilities. Marital status and educational background could influence the time and energy nurses can devote to their work and compliance with safety protocols(40). Interrelated to the monthly income of nurses, The diverse income levels within the nursing workforce can contribute to variations in motivation and job satisfaction. It's important for healthcare organizations to ensure that salaries are commensurate with the demanding nature of nursing work. Around the work-related characteristics, the workplace safety climate relatively higher percentage of nurses reporting a satisfactory workplace safety climate (60.61%) is encouraging, as a positive safety climate can promote adherence to safety protocols. Addressing concerns of the remaining nurses reporting dissatisfaction is crucial for fostering a culture of safety. The nurse work experience, is wide range of work experience among the nurses, with a mean of 13.71 years, underscores the presence of both experienced and less-experienced practitioners in the study(41). This heterogeneity can impact the collective knowledge-sharing and decision-making within the nursing team. The working area-place, the predominance of staff nurses (77.27%) and charge nurses (20.45%) indicates the distribution of roles within healthcare settings. Staff nurses, being the majority, play a critical role in hands-on patient care and, thus, adherence to safety protocols(42).

Approximately the area of practice of nurse, the diverse representation across various clinical departments highlights the multidisciplinary nature of nursing. The variations in clinical settings could introduce differences in the types of patient safety challenges and compliance requirements nurses face. While the working hours per week, the reported average working hours per week (37.98) and the distribution across different work-hour groups can impact nurses' overall well-being, fatigue levels, and their ability to maintain vigilance in adhering to safety guidelines. linked to training courses of nurses on standard adherence precaution, the high percentage of nurses who had received training on standard adherence precautions (68.18%) is promising. This training could contribute to enhancing nurses' knowledge and skills in patient safety, potentially translating to improved compliance(43). Nearby, the secondary jobs and shift patterns of the nurses, the revelation that a significant number of nurses (72.73%) have only one job been important, as multiple job commitments can contribute to fatigue and stress, potentially affecting adherence to safety protocols(44). Additionally, understanding the distribution of shift patterns is vital in assessing nurses' fatigue levels and cognitive functioning, both of which can impact compliance.

In summary, the presented characteristics collectively contribute to a comprehensive understanding of the nurses participating in the study. The diversity in age, gender, work experience, educational background, and work-related factors highlights the complex nature of the nursing profession. These characteristics are essential considerations when analyzing the potential influence of nurse compliance and workload on patient safety outcomes.

CONCLUSION

In conclusion, the association between nurse compliance and workload concerning patient safety is a multifaceted and critical aspect of healthcare quality. Nurses' adherence to evidence-based protocols directly influences patient safety outcomes, while their workload a combination of clinical, administrative, and emotional demands can impact their ability to comply with these protocols. Understanding the intricate relationship between nurse compliance, workload, and patient safety is crucial for designing effective interventions that promote both patient well-being and nurse job satisfaction.

Through a cross-sectional study, we aim to empirically investigate the nuanced relationship between nurse compliance, workload, and patient safety outcomes. The association between these factors underscores the need for healthcare organizations to address nurse workload management as a fundamental aspect of their patient safety initiatives. By identifying strategies to mitigate excessive workload and fostering a supportive work environment, healthcare institutions can empower nurses to consistently adhere to best practices and optimize patient outcomes.

LIMITATIONS AND RECOMMENDATIONS

This study had certain limitations. The cross-sectional design of the research restricted the target population to nurses working in clinical areas or hospital settings, rather than encompassing all nurses working in the healthcare directorate. As a result, Causality was difficult to establish due to this limitation. Additionally, the convenience sampling technique made it challenging to generalize the findings. The safety environment on some units may have influenced participants' decisions in the research. The study employed a self-report questionnaire, which potentially introduced discrepancies between the nurses' self-assessment of their adherence to patient safety and standard precautions obligations and the actual assessments.

The funding of this study provides valuable insights into the adherence and compliance of nursing staff and healthcare services in clinical areas or settings, specifically in Duhok province's healthcare organization and DGoH. The researcher proposes further studies on these issues, it is of utmost importance to prioritize the incorporation of significant elements or parts of curricula of nursing colleges as core topics to teach, train, and coach nurses on the key concepts of infection control and patient safety, and how nurses deal with perception, adherence, and compliance concerning patient safety at all levels of service provision.

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AUTHORS' CONTRIBUTION

The authors contributed to the implementation of the research design, data analyzing and results interpretation, and writing the original manuscript draft, other contribution participated as follows; 2nd as my supervisor review and editing the paper, 3rd authors cooperate with writing plan and correct Grammer manuscript mistakes, all authors have read and agreed to the published this paper.

Conflicts of Interest

The authors declare no conflict of interest.

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