

## Original Article

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# Patient Safety Culture in Emergency Departments of Yemeni Public Hospitals: A Survey Study

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## Abstract

**Introduction:** Quality and safety is an important challenge in healthcare systems all over the world particularly in developing parts.

**Objective:** This survey aimed to assess patient safety culture (PSC) in emergency departments (EDs) in Yemen and identify its associated factors.

**Methods:** A questionnaire containing the Hospital Survey on Patient Safety Culture (HSOPSC) was distributed to ED physicians, nurses, and clinical, and non-clinical staff at three public teaching general hospitals. The percentages of positive responses on the 12 patient safety dimensions and the summation of PSC and two outcomes (overall patient safety grade and adverse events reported in the past year) were assessed. Factors associated with PSC aggregate score were analyzed.

**Results:** finally, out of 400 questionnaires, 250 (64%) were analyzed. In total, 207 (82.3%) participants were nurses and physicians; 140 (56.0%) were male; 134 (53.6%) were less than 30 years old; and 134 (53.6%) had a university degree. Participants provided the highest ratings for the "teamwork within units" PSC composite (67%). The lowest rating was for "non-punitive response to error" (21.3%). A total of 120 (48.1%) participants did not report any events in the past year and 99 (39.7%) gave their hospital an "excellent/very good" overall patient safety grade. There were significant differences between the hospitals' EDs in the rating of "handoffs and transitions" ( $p=0.016$ ), "teamwork within units" ( $p=0.018$ ), and "frequency of adverse events reported" ( $p=0.016$ ). Staff working in intensive care units (8.4%,  $n=21$ ) had lower patient safety aggregate scores.

**Conclusions:** PSC ratings appear to be low in Yemen. This study emphasizes the need to create and maintain a PSC in EDs through the implementation of quality improvement strategies and environment of transparency, open communications, and continuous learning.

**Key words:** Communication; Emergency Care; Patient Safety Culture; Questionnaires; Staff Attitudes; Yemen

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## INTRODUCTION

Patient safety and patient safety culture (PSC) are becoming an area of increasing interest in healthcare (1). Patient safety has an impact on the cost of healthcare, and it has been reported that medical errors cause between 44,000 and 98,000 patient deaths annually (2). The Institute of Medicine defines patient safety as the prevention of harm to patients, and emphasize a system of care

delivery that prevents errors, learns from mistakes that do occur, and is raised on safety culture that involves healthcare professionals, organizations, and patients (3, 4). High-reliability organizations have focused on establishing a culture of safety. PSC require understanding values and belief of staff, and pattern about what is critical to a healthcare organization, and therefore, system-

based interventions that are essential to ensure patient safety and improve quality of care (2, 5, 6). Emergency departments (EDs) are the first place where many patients receive medical attention and are considered high-risk environments where adverse events (AEs) may occur (7). A high-risk environment is a work environment characterized by time constraints, multiple interruptions, high patient volume, and disturbed sleep cycles for healthcare providers. Other factors include high-risk diagnostic and therapeutic interventions, and variable levels of physician training (7). The Harvard Medical Practice Study found that 70% of AEs in the ED were due to negligence (8). In 2013, a systematic review of adverse event rates in EDs found that 36% to 71% of AEs were preventable [9].

To improve patient safety, enhancing positive PSC is required (10, 11). Staff's perception and beliefs related to patient safety and cultural attributes contribute to achieving a desirable safety culture in the organization (12). Staff with a positive safety culture are more likely to engage in safety-related behaviors than those with a negative safety culture (1, 13, 14). An assessment of the prevalent culture needs to be the first step when building patient safety programs in healthcare organizations (13, 14). The Agency for Healthcare Research and Quality (AHRQ) initially developed the Hospital Survey on Patient Safety Culture (HSOPSC) to measure safety culture (13). This survey has been used in different clinical settings worldwide including a few countries from the Arab sector (1, 15) and only was conducted in Yemen (16).

A conclusion from systematic review conducted recently in Arab countries has found that a blame culture still exists, limits reporting adverse events and that a non-punitive response to AEs is considered an important area that needs improvement (17). To date, there is no study on PSC in Yemeni EDs. Thus, this study aimed to assess the prevalence of PSC in the EDs of three major public hospitals in Yemen and to identify factors associated with PSC.

## Methods

### **Study design and setting**

A survey study using the HSOPSC questionnaire (14) was performed in the EDs of three main public teaching general hospitals (Al-Thawra Hospital, Al-Kuwait Hospital, and Al-Jomhori Hospital) in Sanaa, Yemen. Data were collected during March, May, July, and September 2018. Al-Thawra Hospital has 760 beds and 250,000 ED visits/year, Al-Jomhori Hospital has 470 beds and 100,000 ED

visits/year, and Al-Kuwait Hospital has 302 beds and 50,000 ED visits/year. Al-Thawra Modern General Hospital is a teaching hospital, level 1 trauma center, and the largest and most prestigious multidisciplinary medical institution in Yemen. Annual emergency admissions exceed 320,000 patients. The ED provides comprehensive consultations and surgical care utilizing techniques including minimally invasive and endoscopic surgery in all surgical sub-specialties. It is the only hospital in Yemen that is recognized by the Ministry of Health and by the Arab Board of Health Specializations as an Emergency Medicine residency training center in Yemen. The EM program is a well-established 4-year program. The three hospitals do not have information system or any electronic medical records. The number of professionals varies from 100 to 200 employees in each hospital.

### **Participants**

Study targeted all the clinical and non-clinical staff who have direct contact with patients (physicians and nurses), and staff without direct contact with patients but who work with the healthcare providers and involved in the patient care (paramedics and support services, nursery managers and supervisors). The participants must have had at least six months of experience in the ED. Participants were selected by convenience sampling via accessible manner (they were not selected randomly). All eligible participants who were available during the study period were contacted.

The questionnaires were distributed to 400 staff members in the EDs. We followed the AHRQ guidelines which proposed to examine each returned survey for possible evaluation before the survey responses are entered into the dataset. We excluded returned surveys that are completely blank or contain responses only for the background demographic questions, or contain the exact same answer to all the questions in the survey. Since a few survey items are negatively worded, the same exact response to all items indicates the respondent probably did not pay careful attention and the responses were probably not valid. Only participants with at least 6 months of experience in EDs were included in the study.

### **Evaluation tool and data collection**

The HSOPSC was used to assess the PSC within EDs. The HSOPSC consists of 42 items grouped in 12 composites (18). A valid and reliable Arabic translation of the HSOPSC was used (19) and includes both positively and negatively worded items; a five-point Likert scale is used to score each

item. For each item, we calculated the mean score, standard deviation (SD), and percent positive scores; we reverse-coded negatively worded items (% of items receiving a score of 4 or 5 for positively worded items and a score of 1 or 2 for negatively worded items). Accordingly, areas of strength in PSC were defined as “those items that received positive answers from 75% of respondents,” whereas areas of potential for improvement were identified as “having potential for PSC improvement received negative answers from 50% or more of respondents”. To calculate the composite scores (CS), we summed the items within the composite scales and divided the sum by the number of items. Moreover, an aggregate score was computed by adding up all the CS and dividing by the number of items. In addition, we added two single-item outcome measures, the overall patient safety grade (rated as “excellent, very good, acceptable, poor, and failing”) and the number of AEs reported last year (rated as “No events, 1–5 events and > 5 events”). Cronbach’s  $\alpha$  was used to calculate internal consistency.

A paper-based self-administered questionnaire containing the HSOPSC and all other questions on the participants’ demographic characteristics and workplace was distributed in the three hospitals. There were two survey periods of 1 week each to maximize the response rate [20]. Participants who had completed the first survey were excluded from the second survey. Participants who gave the same answer to all questions and those who did not answer all questions were also excluded (20).

#### **Ethical considerations**

The study’s ethical approval was obtained from the Ministry of Health. The study’s objectives were provided to each participant in written form. The study was conducted in an ethical and confidential manner. The answers were de-identified and collected exclusively for research purposes. Participation was voluntary with the right to withdraw at any time. Participants were asked for their consent by asking them to answer the questions only if they agreed with the objectives of the study

#### **Statistical analysis**

Data were analyzed using SPSS version 23 (SPSS IBM, Chicago, IL, USA). Demographic data and PSC composite scores were summarized using descriptive statistics. Frequency analyses were performed to identify missing data and outliers. We followed the AHRQ guidelines which proposed to examine each returned survey for possible evaluation before the survey responses are entered into the dataset. We excluded returned surveys

that are completely blank or contain responses only for the background demographic questions, or contain the exact same answer to all the questions in the survey. Since a few survey items are negatively worded, the same exact response to all items indicates the respondent probably did not pay careful attention and the responses were probably not valid. The HSOPSC user Guide (21) was used for data analysis. The chi-square test was used to examine patient safety outcomes (overall grade and number of AEs reported) according to hospital and participant characteristics. A one-way ANOVA was used to test differences in PSC composite and aggregate scores according to hospital and participant characteristics. A T-test was used to assess the difference in PSC aggregate scores between participants with and without contact with patients. A p-value of less than 0.05 was considered statistically significant.

To assess the participant effect and characteristics of hospital on safety culture measures, bivariate and multivariate models were constructed. Multiple linear regression, using Enter method which is used to include the independent variables in regression model to see the contribution of each variable in the outcome, was conducted to evaluate the effect of hospital and participant characteristics (independent variables) on the aggregate composite score (dependent variable).

## **RESULTS**

### **Response rate**

Out of the 400 questionnaires distributed in the three EDs, 256 were returned, and 6 of them were excluded owing to incomplete data. The final sample was thus 250, and the overall response rate was 64%.

### **Demographic characteristics**

Data were collected from the three hospitals as follows: Al-Thawra (n=109), Al-Kuwait (n=78), and Al-Jomhori (n=63). Over half of the participants were less than 30 years old (53.6%, n=134), and 56.0% were men (n=140). Participants were mostly physician assistant/nurse practitioners (20%, n=50), registered nurses (19.2%, n=48), and physicians in training (17.2%, n=43). The characteristics of the participants are shown in table 1.

### **PSC measures**

Mean percentage of positive responses to HSOPSC composites ranged from 21.3% to 67.0% (Table 2). The highest positive response percentages were reported in “teamwork within units” (67.0%), “organizational learning/continuous improvement” (58.6%), “supervisor/manager expectations and

**Table 1:** Socio-demographic and professional characteristics of participants (n=250)

| Variable  | Nurses     | Physicians | Others*   |
|---|------------|------------|-----------|
|   | Number (%) |            |           |
| <b>Age (year)</b>   |            |            |           |
| < 30  | 83 (61.0)  | 29 (46.8)  | 22 (42.3) |
| 30 to 45  | 42 (30.9)  | 28 (45.2)  | 25 (48.1) |
| 46 to 55  | 8 (5.9)    | 3 (4.8)    | 4 (7.7)   |
| > 55  | 3 (2.2)    | 2 (3.2)    | 1 (1.9)   |
| <b>Sex</b>  |            |            |           |
| Male  | 70 (51.5)  | 38 (61.3)  | 32 (61.5) |
| Female  | 66 (48.5)  | 24 (38.7)  | 20 (38.5) |
| <b>Current site of work</b>   |            |            |           |
| Al-Thawra hospital  | 73 (53.7)  | 22 (35.5)  | 14 (26.9) |
| Al-Kwait hospital   | 20 (14.7)  | 28 (45.2)  | 30 (57.7) |
| Al-Jomhori hospital   | 43 (31.6)  | 12 (19.4)  | 8 (15.4)  |
| <b>Where did you graduate and got your degree?</b>  |            |            |           |
| Technical school  | 8 (5.9)    | 1 (1.6)    | 2 (3.8)   |
| Hospital  | 30 (22.1)  | 5 (8.1)    | 6 (11.5)  |
| College (Nursing Diploma)   | 54 (39.7)  | 0 (0.0)    | 10 (19.2) |
| University  | 44 (32.4)  | 56 (90.3)  | 34 (65.4) |
| <b>What is your primary work area or unit in this hospital?</b>                                   |            |            |           |
| Many different hospital units/No specific unit  | 9 (6.6)    | 4 (6.5)    | 2 (3.8)   |
| Medicine (non-surgical)   | 94 (69.1)  | 35 (56.5)  | 12 (23.1) |
| Surgery   | 2 (1.5)    | 9 (14.5)   | 1 (1.9)   |
| Obstetrics  | 2 (1.5)    | 1 (1.6)    | 1 (1.9)   |
| Pediatrics  | 5 (3.7)    | 2 (3.2)    | 1 (1.9)   |
| Intensive care unit   | 20 (14.7)  | 1 (1.6)    | 0 (0.0)   |
| Psychiatry/mental health  | 0 (0.0)    | 1 (1.6)    | 1 (1.9)   |
| Rehabilitation  | 1 (0.7)    | 0 (0.0)    | 0 (0.0)   |
| Pharmacy  | 0 (0.0)    | 0 (0.0)    | 4 (7.7)   |
| Laboratory  | 1 (0.7)    | 3 (4.8)    | 16 (30.8) |
| Radiology   | 1 (0.7)    | 1 (1.6)    | 6 (11.5)  |
| Anesthesiology  | 0 (0.0)    | 2 (3.2)    | 2 (3.8)   |
| Orthopedic  | 1 (0.7)    | 1 (1.6)    | 0 (0.0)   |
| Administration/Management   | 0 (0.0)    | 0 (0.0)    | 4 (7.7)   |
| Others*   | 0 (0.0)    | 2 (3.2)    | 2 (3.8)   |
| <b>How long have you worked in this hospital? (year)</b>  |            |            |           |
| < 1   | 26 (19.1)  | 8 (12.9)   | 4 (7.7)   |
| 1 to 5  | 51 (37.5)  | 38 (61.3)  | 21 (40.4) |
| 6 to 10   | 28 (20.6)  | 9 (14.5)   | 11 (21.2) |
| 11 to 15  | 20 (14.7)  | 3 (4.8)    | 8 (15.4)  |
| 16 to 20  | 4 (2.9)    | 3 (4.8)    | 3 (5.8)   |
| ≥ 21  | 7 (5.1)    | 1 (1.6)    | 5 (9.6)   |
| <b>How long have you worked in your current hospital work area/unit? (year)</b>                   |            |            |           |
| < 1   | 28 (20.6)  | 10 (16.1)  | 10 (19.2) |
| 1 to 5  | 60 (44.1)  | 41 (66.1)  | 23 (44.2) |
| 6 to 10   | 28 (20.6)  | 4 (6.5)    | 9 (17.3)  |
| 11 to 15  | 9 (6.6)    | 3 (4.8)    | 5 (9.6)   |
| 16 to 20  | 7 (5.1)    | 4 (6.5)    | 2 (3.8)   |
| ≥ 21  | 4 (2.9)    | 0 (0.0)    | 3 (5.8)   |
| <b>Typically, how many hours per week do you work in this hospital? (hours per week)</b>          |            |            |           |
| < 20  | 27 (19.9)  | 12 (19.4)  | 6 (11.5)  |
| 20 to 39  | 45 (33.1)  | 24 (38.7)  | 26 (50.0) |
| 40 to 59  | 54 (39.7)  | 16 (25.8)  | 16 (30.8) |
| 60 to 79  | 7 (5.1)    | 4 (6.5)    | 2 (3.8)   |
| 80 to 99  | 1 (0.7)    | 4 (6.5)    | 1 (1.9)   |
| ≥ 100   | 2 (1.5)    | 2 (3.2)    | 1 (1.9)   |
| <b>In your staff position, do you typically have direct interaction or contact with patients?</b> |            |            |           |
| Yes   | 122 (89.7) | 55 (88.7)  | 30 (57.7) |
| No  | 14 (10.3)  | 7 (11.3)   | 22 (42.3) |
| <b>How long have you worked in your current specialty or profession? (year)</b>                   |            |            |           |
| < 1   | 22 (16.2)  | 11 (17.7)  | 4 (7.7)   |
| 1 to 5  | 54 (39.7)  | 36 (58.1)  | 22 (42.3) |
| 6 to 10   | 30 (22.1)  | 8 (12.9)   | 14 (26.9) |
| 11 to 15  | 18 (13.2)  | 3 (4.8)    | 6 (11.5)  |
| 16 to 20  | 7 (5.1)    | 3 (4.8)    | 3 (5.8)   |
| ≥ 21  | 5 (3.7)    | 1 (1.6)    | 3 (5.8)   |

\*Include technicians, pharmacists, administrative staff, therapists

actions promoting patient safety" (45.7%), and "overall perceptions of patient safety" (42.6%). The lowest positive response percentages were in "communication openness" (30.5%), "handoffs and transitions" (26.6%), "frequency of AEs reported" (24.4%), and "non-punitive response to errors" (21.3%). Interestingly, all items were found in areas requiring improvement in participating hospitals, as shown in table 2. The internal consistency of the HSOPSC was measured by

calculating Cronbach's  $\alpha$  for the 12 composites, which ranged between 0.206 and 0.779. The overall patient safety grade is reported in figure 1. The majority of participants stated they were not involved in any AEs in the past 12 months (Figure 2).

#### Differences in PSC

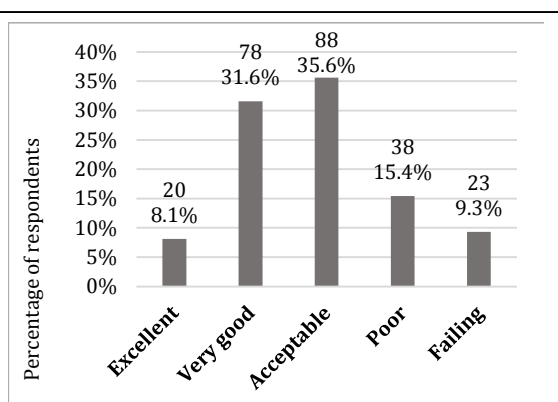
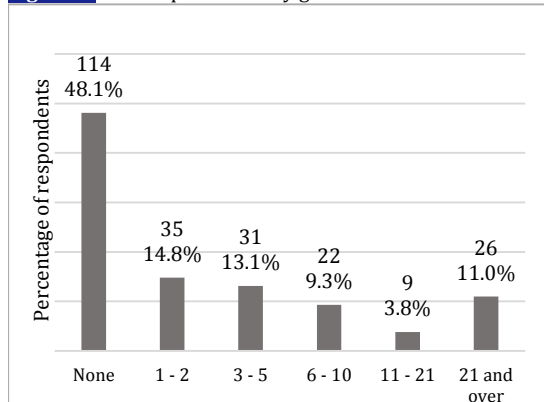
Regarding the differences in PSC composites between the three hospitals, Al-Jomhori Hospital had a higher percentage of positive responses in

**Table 2:** Distribution of positive responses for composites of the Hospital Survey on Patient Safety Culture (HSOPSC)

| Composites and Items  | positive responses (%) |
|---|------------------------|
| <b>Teamwork Within Units (Cronbach's <math>\alpha=0.70</math>)</b>  | <b>67.0</b>            |
| People support one another in this unit   | 68.4                   |
| When a lot of work needs to be done quickly, we work together as a team to get the work done                          | 70.8                   |
| In this unit, people treat each other with respect  | 60.8                   |
| When one area in this unit gets really busy, others help out  | 67.9                   |
| <b>Supervisor/Manager Expectations &amp; Actions Promoting Patient Safety (Cronbach's <math>\alpha=0.45</math>)</b>   | <b>45.7</b>            |
| My supervisor/manager says a good word when he/she sees a job done according to established patient safety procedures | 51.0                   |
| My supervisor/manager seriously considers staff suggestions for improving patient safety                              | 46.1                   |
| Whenever pressure builds up, my supervisor/manager wants us to work faster, even if it means taking shortcuts         | 37.7                   |
| My supervisor/manager overlooks patient safety problems that happen over and over                                     | 48.1                   |
| <b>Organizational Learning/Continuous Improvement (Cronbach's <math>\alpha=0.62</math>)</b>                           | <b>58.6</b>            |
| We are actively doing things to improve patient safety  | 71.5                   |
| Mistakes have led to positive changes here  | 47.3                   |
| After we make changes to improve patient safety, we evaluate their effectiveness                                      | 57.1                   |
| <b>Management Support for Patient Safety (Cronbach's <math>\alpha=0.56</math>)</b>                                    | <b>34.1</b>            |
| Hospital management provides a work climate that promotes patient safety  | 28.8                   |
| The actions of hospital management show that patient safety is a top priority   | 45.8                   |
| Hospital management seems interested in patient safety only after an adverse event happens                            | 27.7                   |
| <b>Overall Perceptions of Patient Safety (Cronbach's <math>\alpha= 0.21</math>)</b>                                   | <b>42.6</b>            |
| It is just by chance that more serious mistakes don't happen around here  | 35.2                   |
| Patient safety is never sacrificed to get more work done  | 65.6                   |
| We have patient safety problems in this unit  | 20.7                   |
| Our procedures and systems are good at preventing errors from happening   | 49.0                   |
| <b>Feedback &amp; Communication About Error (Cronbach's <math>\alpha=0.71</math>)</b>                                 | <b>35.8</b>            |
| We are given feedback about changes put into place based on event reports   | 24.9                   |
| We are informed about errors that happen in this unit   | 40.4                   |
| In this unit, we discuss ways to prevent errors from happening again  | 42.1                   |
| <b>Communication Openness (Cronbach's <math>\alpha=0.21</math>)</b>   | <b>30.5</b>            |
| Staff will freely speak up if they see something that may negatively affect patient care                              | 28.6                   |
| Staff feel free to question the decisions or actions of those with more authority                                     | 30.8                   |
| Staff are afraid to ask questions when something does not seem right  | 32.1                   |
| <b>Frequency of Events Reported (Cronbach's <math>\alpha=0.78</math>)</b>   | <b>24.4</b>            |
| When a mistake is made, but is caught and corrected before affecting the patient, how often is this reported?         | 20.6                   |
| When a mistake is made, but has no potential to harm the patient, how often is this reported?                         | 22.9                   |
| When a mistake is made that could harm the patient, but does not, how often is this reported?                         | 29.8                   |
| <b>Teamwork Across Units (Cronbach's <math>\alpha=0.51</math>)</b>  | <b>33.8</b>            |
| Hospital units do not coordinate well with each other   | 27.9                   |
| There is good cooperation among hospital units that need to work together   | 44.6                   |
| It is often unpleasant to work with staff from other hospital units   | 20.9                   |
| Hospital units work well together to provide the best care for patients   | 41.9                   |
| <b>Staffing (Cronbach's <math>\alpha=0.36</math>)</b>   | <b>33.2</b>            |
| We have enough staff to handle the workload   | 39.3                   |
| Staff in this unit work longer hours than is best for patient care  | 29.4                   |
| We use more agency/temporary staff than is best for patient care  | 37.6                   |
| We work in "crisis mode" trying to do too much, too quickly   | 26.6                   |
| <b>Handoffs &amp; Transitions (Cronbach's <math>\alpha=0.71</math>)</b>   | <b>26.6</b>            |
| Things "fall between the cracks" when transferring patients from one unit to another                                  | 35.0                   |
| Important patient care information is often lost during shift changes   | 26.9                   |
| Problems often occur in the exchange of information across hospital units   | 18.1                   |
| Shift changes are problematic for patients in this hospital   | 26.5                   |
| <b>Non-punitive Response to Errors (Cronbach's <math>\alpha=0.53</math>)</b>  | <b>21.3</b>            |
| Staff feel like their mistakes are held against them  | 26.4                   |
| When an event is reported, it feels like the person is being written up, not the problem                              | 16.1                   |
| Staff worry that mistakes they make are kept in their personnel file  | 21.2                   |

**Table 3:** Distribution of positive responses for Hospital Survey on Patient Safety Culture (HSOPSC) composites in the three hospitals

| Composites and items  | Hospital  |           |            | p            |
|---|-----------|-----------|------------|--------------|
|   | Al-Thawra | Al-Kuwait | Al-Jomhori |              |
|   | Mean±SD   |           |            |              |
| <b>Teamwork Within Units</b>  | 62.9±6.5  | 66.2±2.8  | 75.2±4.9   | <b>0.018</b> |
| <b>Supervisor/Manager Expectations &amp; Actions Promoting Patient Safety</b> | 45.2±3.1  | 47.2±7.5  | 45.0±14.9  | 0.939        |
| <b>Organizational Learning/Continuous Improvement</b>                         | 52.0±13.6 | 63.2±9.7  | 64.1±14.7  | 0.480        |
| <b>Management Support for Patient Safety</b>                                  | 31.3±5.5  | 36.4±14.4 | 35.9±14.0  | 0.855        |
| <b>Overall Perceptions of Patient Safety</b>                                  | 41.7±21.6 | 46.6±17.7 | 39.3±22.7  | 0.880        |
| <b>Feedback &amp; Communication About Error</b>                               | 31.3±6.3  | 34.5±16.5 | 44.7±9.9   | 0.400        |
| <b>Communication Openness</b>   | 27.4±7.3  | 34.2±5.3  | 31.0±3.5   | 0.388        |
| <b>Frequency of Events Reported</b>   | 16.1±4.3  | 24.8±3.3  | 38.4±9.9   | <b>0.016</b> |
| <b>Teamwork Across Units</b>  | 29.4±7.9  | 35.2±12.2 | 39.3±18.1  | 0.596        |
| <b>Staffing</b>   | 29.8±9.0  | 40.0±6.4  | 30.6±10.7  | 0.248        |
| <b>Handoffs &amp; Transitions</b>   | 35.2±8.7  | 15.9±3.6  | 24.3±8.9   | <b>0.016</b> |
| <b>Non-punitive Response to Errors</b>  | 23.3±8.0  | 22.2±5.8  | 16.7±7.6   | 0.527        |

**Figure 1:** Overall patient safety grade**Figure 2:** Reporting of events in the past 12 months

“teamwork within units” and “frequency of adverse events reported” than Al-Kuwait Hospital and Al-Thawra Hospital. Positive responses in the “handoffs and transitions” composite were significantly higher in Al-Thawra Hospital than in Al-Kuwait Hospital and Al-Jomhori Hospital. Other PSC composites did not show significant differences between the three hospitals (Table 3). Participants from Al-Jomhori Hospital reported an “excellent/very good” overall patient safety grade more often (49.2%, n=31) than Al-Kuwait (45.5%,

n=35) and Al-Thawra (29.9%, n=32) hospitals (p=0.001). Physicians had a significantly less positive perception of the PSC in their organizations (20.0%, n=12) when compared with nurses and other staff (58 (42.6%) vs. 28 (54.9%); p=0.001).

The rate of Al-Kuwait Hospital participants reporting more than five AEs was significantly higher (35.2%, n=27) than at Al-Jomhori and Al-Thawra hospitals (13 (21.3%) vs. 19 (18.1%); p=0.020). Additionally, physicians reported more AEs than nurses and other staff (p=0.031). Staff with 1-5 years of working experience either in hospitals or other settings reported more AEs compared with those with less or more years of experience (P<0.001 and 0.001, respectively). However, participants with 1-5 years and more than 11 years of experience in their profession reported more AEs than those with less than 1 year and with 6-10 years of experience (p=0.023) (Appendix 1).

#### **Factors associated with PSC aggregate score**

In the bivariate analysis, the average PSC aggregate score of Al-Jomhori Hospital was significantly higher than that of the other hospitals (2.98 vs. 2.93 and 2.78, respectively; p=0.013). Physicians had significantly lower aggregate scores than nurses and other staff (2.69 vs. 2.95 and 2.93, p=0.001), and non-resident staff had significantly higher aggregate scores than others (2.91 vs. 2.57, p=0.001). In addition, participants working in the medical unit of EDs had lower aggregate scores than those working in other units (p=0.039) (Appendix 2).

In multivariate analysis, Al-Jomhori Hospital had a higher PSC aggregate score (B=0.15, SE=0.07 and p=0.038) than other hospitals, and nurses had a higher aggregate score (B=0.24, SE=0.09 and p=0.011) than other staff. Moreover, significant aggregate scores were also found for those who

work in hospital wards working in medical units ( $B=-0.40$ ,  $SE=0.13$  and  $p=0.002$ ), ICUs ( $B=-0.41$ ,  $SE=0.14$  and  $p=0.012$ ), and multiple different units ( $B=-0.39$ ,  $SE=0.16$  and  $p=0.019$ ), compared with those working in any other units (Appendix 3).

## DISCUSSION

To our knowledge, this study is the first study assessing PSC in EDs in Yemen. The mean percentage of positive responses for all PSC composites ranged from 21% to 67%, which is lower than the values recommended by the AHRQ. The composites with the highest and lowest positive ratings were similar to those observed in previous studies from the Middle East region (1, 15, 22). Our study revealed lower positive ratings on all composites than previous studies, except “Non-punitive response to error,” which was rated higher than in previous studies (CS of 21.3%) (1, 15, 22).

Our results showed low Cronbach's  $\alpha$ . The CS in this study was lower than those in the other studies on all items except one. The composite score on “non-punitive response to errors” was higher in this study than in the Palestinian study. Moreover, this survey showed lower overall patient safety grades and lower numbers of reported AEs than the other studies. Our results were lower than the AHRQ data, which suggests that the consistency of the responses to every question was very poor. According to the HSOPSC user guide, a Cronbach's  $\alpha$  of 0.6 is acceptable (21). However, lower Cronbach's  $\alpha$  are expected due to the diversity of the constructs being measured. Further analysis and research are needed to examine factors influencing wide variations in Cronbach's  $\alpha$ . The PSC composite scores, overall patient safety grade, and number of reported AEs were compared with three regional studies (1, 15, 22) and one study from the USA (13) (Figure 2). In our study, the lowest-rated composites were “non-punitive response to error” and “frequency of adverse events reported.” Staff was unwilling to report incidents because they were afraid that if they made an error it will be kept in their file record permanently and could be used against them (15, 16). In a recent systematic review on PSC done in Arab countries; participant perception about non-punitive response to mistake is the least frequent practice in their organizations (17). In Arab countries healthcare providers under impression of that a just culture doesn't yet exist which may influence their willing to reporting AEs (17).

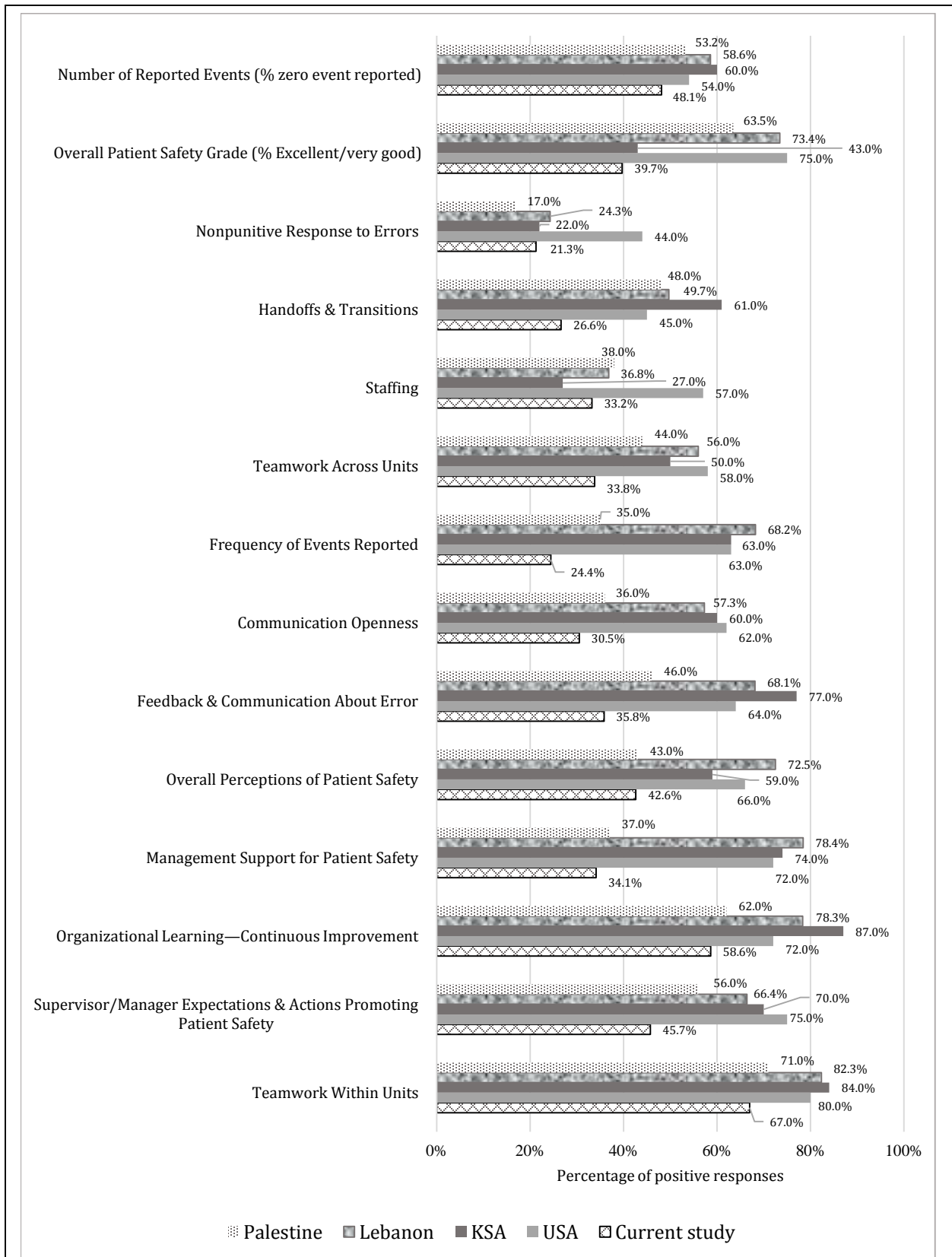
There is urgent need to prompt patient safety and to thoroughly investigate poor incidents reports by

healthcare staff in Yemen, to ensure that all learnt from it. Undoubtedly, it will require concerted work and collaboration from hospital leaders and front-line staff to prospectively address it through systems-based solutions. Conversely, learning and continuous improvement were among the highest scoring positive dimensions among these professionals, along with teamwork within units, which is consistent with the results of our study (17).

Furthermore, in Yemen, some adverse event reports appear in the media, presented as crimes, which causes fear among healthcare providers and makes professionals who commit an error vulnerable to denial (23). For this reason, building broad psychological safety in healthcare organizations is a challenge; to achieve it, fear of reporting errors must be eradicated, but, unfortunately, it is often pervasive in organizational culture. Lucian Leape, often considered the father of the current safety movement, identified the problem precisely when he said, “The single greatest impediment to error prevention in the medical industry is that we punish people for making mistakes”

The third lowest-rated composite in our study was “handoffs and transitions,” highlighting that important information about a patient is often lost during handout time. A recent study showed that staff's perceptions of behavioral aspect of handoffs impact their appreciation of level of the hospital in regard to patient safety (24). In our study, overall patient safety was graded as “very good” or “excellent” by only 39.7% of the staff. As it is well-known that there is psychological relationship between perception, behavior, and conduct, a possible conclusion can be drawn that healthier culture can be achieved with investing more effort in enhancing information transfer through coaching and monitoring (24-26). Communication failure among health care professionals was involved in more than 60% of sentinel events reported to the Joint Commission on Accreditation of Health Organizations, and almost 80% of serious incidents were handoff errors (27). Most errors linked to communication failures have been shown to be preventable (27). To improve handoffs, healthcare policy makers need to understand how staff perceive their institutions' culture of patient safety (12).

The “communication openness” was the fourth lowest-rated dimension. Our results revealed that only a small percentage (28.6%) of participants would raise their voice if observing something that might impact patient care in negative way. It is



**Figure 2:** Comparison of composite-level mean percentages of positive responses and patient safety outcomes between hospitals in the current study and other Arab countries (Palestine, Lebanon, and Kingdom of Saudi Arabia [KSA]) and United States (USA)



worth mentioning that Yemenis, like other people from Arab countries characteristically traditional in discussion, response, and criticism rarely bearable [15,16]. Disagreement with supervisors and criticism are often understood as blame and may affect relationships or career; thus, majority of staff tend to avoid these behaviors (16).

Staffing was the fifth lowest-rated dimension (composite score of 33.2 %). In our study, most participants expressed worries about short-staffing, overcrowding, prolonged patient boarding, and high workloads, keeping in mind the war and economic crisis in Yemen.

ED overcrowding and understaffing are major causes of poor well-being, anxiety, depression, and burnout among staff, which are correlated with inefficient patient care and outcomes such as AEs and errors (9). Consequently, Yemeni EDs can take advantage of plans to enhance working environment and reduce overcrowding to improve staff's well-being, thereby reducing errors and ensuring patient safety.

The sixth lowest ranked dimension was "teamwork across units" related to coordination between departments/units (composite of 33.8%). Actions to take to improve this dimension might include transmitting the concept of shared responsibility for the patient, promoting the interrelationship between different services, and structuring transfers of patients, information, and leadership commitments (24-26).

Regarding the difference in positive responses of PSC composite scores among the three hospitals, positive response in the handoffs and transitions composites was significantly higher in Al-Thawra Hospital than in Al-Kuwait Hospital and Al-Jomhori Hospital. In handoffs and transitions, the composite score can likely be explained by the requirement of the EM residency program leadership training and implementation of formal, safe, hands-on, and intra- and inter-departmental patient transfer.

However, our study revealed lower positive ratings in all composites than previous studies, so residency program training might not be enough to ensure a high safety culture. Finally, in Our study provided evidence to help relevant decision makers and stakeholders within the healthcare system to build up an effective system-based approach strategy that may help improve patient safety and ensure good quality of care. Among the methods to improve quality and safety implementation of interventions improving the training of healthcare providers should have a significant impact.

### **Limitations**

A cross-sectional self-administered survey could not be the best methodology to assess PSC because of subjectivity. Another limitation was the low Cronbach's  $\alpha$  for the CS measuring PSC at Yemeni EDs. Moreover, the relatively small sample size could affect the generalization of the results. Nevertheless, our results are similar to those of other studies from the region, even if they were not conducted in EDs. Finally, the results should be interpreted cautiously given the crisis and war in Yemen at the time of the study, which might have had an impact on the perceptions of Yemeni ED staff on PSC.

### **CONCLUSIONS**

Our study revealed that Yemeni ED staff do not feel positively about PSC in their organizations. PSC still has many areas for improvement, particularly in the area of frequency of AEs reported and non-punitive responses to errors. No significant differences in bivariate or multiple regression analyses of PSC aggregate scores were found according to participants' experience, direct interaction or contact with patients, or working hours per week. Our study is the first study to provide benchmark data for PSC and a useful reference for policy makers, managers, and leaders to improve patient safety in Yemen. Further studies are needed in various private and public EDs after the application of quality improvement and patient safety care initiatives to assess progress.

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### **AUTHORS' CONTRIBUTION**

MA and MEA designed the study. MEA was responsible for data collection; and in drafting of the paper. AZ participated in data collection and contributed to the conception and the drafting of the paper. FA performed statistical analysis, and formulated results and participated in writing the manuscript. AE contributed to the conception and the drafting of the paper. AH, MH, and SN contributed to the elaboration and revision of the paper. SG, contributed to the conception and the drafting of the paper. MA proposed the project, MA and AB contributed to the conception, formulation and drafting of the article, participated and supervised the elaboration at every step of the paper writing process and were responsible for coordination of the study and communication with all co-authors. MA and AB participated in writing and revision of the paper.

**CONFLICT OF INTEREST**

None declared.

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| <b>Appendix 1:</b> Overall patient safety grade and events reported according to hospital staff characteristics |                              |            |              |              |                                       |           |           |                  |
|---|------------------------------|------------|--------------|--------------|---------------------------------------|-----------|-----------|------------------|
| Variable  | Overall patient safety grade |            |              | p            | Events reported in the past 12 months |           |           | p                |
|   | Excellent/Very good          | Acceptable | Poor/Failing |              | None                                  | 1 to 5    | >5        |                  |
|   | Number (%)                   |            |              |              | Number (%)                            |           |           |                  |
| <b>Current site of work (Hospital)</b>  |                              |            |              |              |                                       |           |           |                  |
| Al-Thawra   | 32 (29.9)                    | 34 (31.8)  | 41 (38.3)    | <b>0.001</b> | 57 (54.3)                             | 29 (27.6) | 19 (18.1) | <b>0.020</b>     |
| Al-Kuwait   | 35 (45.5)                    | 31 (40.3)  | 11 (14.3)    |              | 23 (32.4)                             | 23 (32.4) | 25 (35.2) |                  |
| Al-Jomhori  | 31 (49.2)                    | 23 (36.5)  | 9 (14.3)     |              | 34 (55.7)                             | 14 (23.0) | 13 (21.3) |                  |
| <b>Staff position in hospital</b>   |                              |            |              |              |                                       |           |           |                  |
| Nurses  | 58 (42.6)                    | 45 (33.1)  | 33 (24.3)    | <b>0.001</b> | 68 (53.1)                             | 30 (23.4) | 30 (23.4) | <b>0.031</b>     |
| Physicians  | 12 (20.0)                    | 25 (41.7)  | 23 (38.3)    |              | 25 (41.7)                             | 15 (25.0) | 20 (33.3) |                  |
| Others  | 28 (54.9)                    | 18 (35.3)  | 5 (9.8)      |              | 21 (42.9)                             | 21 (42.9) | 7 (14.3)  |                  |
| <b>Experience in hospital (year)</b>  |                              |            |              |              |                                       |           |           |                  |
| <1  | 20 (52.6)                    | 10 (26.3)  | 8 (21.1)     | <b>0.071</b> | 28 (80.0)                             | 5 (14.3)  | 2 (5.7)   | <b>&lt;0.001</b> |
| 1 to 5  | 33 (30.8)                    | 46 (43.0)  | 28 (26.2)    |              | 43 (40.6)                             | 31 (29.2) | 32 (30.2) |                  |
| 6 to 10   | 20 (41.7)                    | 12 (25.0)  | 16 (33.3)    |              | 27 (60.0)                             | 11 (24.4) | 7 (15.6)  |                  |
| ≥11   | 25 (46.3)                    | 20 (37.0)  | 9 (16.7)     |              | 16 (31.4)                             | 19 (37.3) | 16 (31.4) |                  |
| <b>Experience in the current hospital work area/unit (year)</b>   |                              |            |              |              |                                       |           |           |                  |
| <1 year   | 23 (47.9)                    | 16 (33.3)  | 9 (18.8)     | <b>0.087</b> | 34 (75.6)                             | 8 (17.8)  | 3 (6.7)   | <b>0.001</b>     |
| 1 to 5  | 45 (36.9)                    | 47 (38.5)  | 30 (24.6)    |              | 49 (40.8)                             | 34 (28.3) | 37 (30.8) |                  |
| 6 to 10   | 12 (29.3)                    | 12 (29.3)  | 17 (41.5)    |              | 20 (52.6)                             | 11 (28.9) | 7 (18.4)  |                  |
| ≥11   | 18 (50.0)                    | 13 (36.1)  | 5 (13.9)     |              | 11 (32.4)                             | 13 (38.2) | 10 (29.4) |                  |
| <b>Experience in profession (year)</b>  |                              |            |              |              |                                       |           |           |                  |
| <1  | 15 (40.5)                    | 13 (35.1)  | 9 (24.3)     | <b>0.528</b> | 26 (76.5)                             | 5 (14.7)  | 3 (8.8)   | <b>0.023</b>     |
| 1 to 5  | 42 (38.5)                    | 39 (35.8)  | 28 (25.7)    |              | 46 (42.6)                             | 31 (28.7) | 31 (28.7) |                  |
| 6 to 10   | 20 (38.5)                    | 15 (28.8)  | 17 (32.7)    |              | 24 (48.0)                             | 16 (32.0) | 10 (20.0) |                  |
| ≥11   | 21 (42.9)                    | 21 (42.9)  | 7 (14.3)     |              | 18 (40.0)                             | 14 (31.1) | 13 (28.9) |                  |

| <b>Appendix 2:</b> Bivariate analysis of factors associated with patient safety culture aggregate score |             |           |                |
|---|-------------|-----------|----------------|
| <b>Variable</b>   | <b>Mean</b> | <b>SD</b> | <b>P-value</b> |
| <b>Current site of work (Hospital)</b>  |             |           |                |
| Al-Thawra Hospital  | 2.78        | 0.47      | 0.013          |
| Al-Kuwait Hospital  | 2.93        | 0.47      |                |
| Al-Jomhori Hospital   | 2.98        | 0.40      |                |
| <b>Staff position in hospital</b>   |             |           |                |
| Nurses  | 2.95        | 0.39      | 0.001          |
| Physicians  | 2.69        | 0.45      |                |
| Other   | 2.93        | 0.58      |                |
| <b>Emergency department residency</b>   |             |           |                |
| Yes   | 2.57        | 0.52      | 0.001          |
| No  | 2.91        | 0.45      |                |
| <b>Primary work area or unit in hospital</b>  |             |           |                |
| Many different hospital units/No specific unit  | 2.88        | 0.50      | 0.039          |
| Non-surgical  | 2.81        | 0.44      |                |
| Surgical  | 2.86        | 0.36      |                |
| Intensive care unit   | 2.95        | 0.49      |                |
| Diagnostic (Radiology/Laboratory)   | 3.02        | 0.57      |                |
| Other   | 3.14        | 0.32      |                |
| <b>Experience in profession (year)</b>  |             |           |                |
| < 1   | 2.89        | 0.44      | 0.669          |
| 1 to 5  | 2.85        | 0.45      |                |
| 6 to 10   | 2.85        | 0.41      |                |
| ≥ 11  | 2.95        | 0.56      |                |
| <b>Experience in hospital (year)</b>  |             |           |                |
| < 1   | 2.94        | 0.43      | 0.594          |
| 1 to 5  | 2.84        | 0.46      |                |
| 6 to 10   | 2.89        | 0.43      |                |
| ≥ 11  | 2.91        | 0.52      |                |
| <b>Experience in the current hospital work area/unit</b>  |             |           |                |
| < 1   | 2.95        | 0.43      | 0.334          |
| 1 to 5  | 2.86        | 0.45      |                |
| 6 to 10   | 2.79        | 0.41      |                |
| ≥ 11  | 2.93        | 0.57      |                |
| <b>Direct interaction or contact with patients</b>  |             |           |                |
| Yes   | 2.87        | 0.43      | 0.410          |
| No  | 2.93        | 0.60      |                |
| <b>Working hours per week</b>   |             |           |                |
| < 20  | 2.91        | 0.42      | 0.811          |
| 20 to 39  | 2.84        | 0.50      |                |
| 40 to 59  | 2.89        | 0.45      |                |
| ≥ 60  | 2.91        | 0.42      |                |

**Appendix 3:** Multivariate analysis of factors associated with patient safety culture aggregate score

| Variable                                     | B     | Standard Error | t     | P-value   | 95% confidence interval for B |             |
|--|-------|----------------|-------|-----------|-------------------------------|-------------|
|  |       |                |       |           | Lower Bound                   | Upper Bound |
| <b>Current site of work (Hospital)</b>       |       |                |       |           |                               |             |
| Al-Kuwait                                    | 0.13  | 0.08           | 1.56  | 0.120     | -0.03                         | 0.29        |
| Al-Jomhori                                   | 0.15  | 0.07           | 2.08  | 0.038     | 0.01                          | 0.30        |
| Al-Thawra                                    |       |                |       | Reference |                               |             |
| <b>Staff position in hospital</b>            |       |                |       |           |                               |             |
| Nurses                                       | 0.24  | 0.09           | 2.55  | 0.011     | 0.06                          | 0.43        |
| Physicians                                   | -0.09 | 0.10           | -0.94 | 0.349     | -0.28                         | 0.10        |
| Other  |       |                |       | Reference |                               |             |
| <b>Primary work area or unit in hospital</b> |       |                |       |           |                               |             |
| Many different units                         | -0.39 | 0.16           | -2.37 | 0.019     | -0.71                         | -0.07       |
| Non-surgical                                 | -0.40 | 0.13           | -3.09 | 0.002     | -0.66                         | -0.15       |
| Surgical                                     | -0.31 | 0.16           | -1.97 | 0.050     | -0.62                         | 0.00        |
| Intensive care                               | -0.41 | 0.16           | -2.54 | 0.012     | -0.73                         | -0.09       |
| Diagnostic                                   | -0.14 | 0.14           | -1.05 | 0.293     | -0.41                         | 0.12        |
| Other  |       |                |       | Reference |                               |             |
| <b>Emergency department residency</b>        |       |                |       |           |                               |             |
| Yes  | 0.09  | 0.14           | 0.64  | 0.524     | -0.18                         | 0.36        |
| No   |       |                |       | Reference |                               |             |

Corrected model F = 4.433, P value = <0.001. R2 = 0.143, adjusted R2 = 0.110. Reference means the other groups are compared to this group