



EFFECTIVENESS OF VITAL SIGN OBSERVATIONS IN DETECTING CARDIOPULMONARY ARREST: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Background: Cardiopulmonary arrest (CPA) is a condition that is fatal and requires immediate action to be taken by the medical practitioners. The opportunity to detect the disease in its early stage by monitoring the vital signs increases the probability of survival. This paper aims to determine the efficiency of the observations of the vital signs in the early detection of CPA among patients in DHQ Hospital, Mishti Mela Orakzai, KPK.

Objectives: The objectives of the study are to determine the role of vital sign monitoring in identifying the signs of cardiopulmonary arrest, identify the correlation between the abnormal vital signs and CPA development, and analyze the influence of early detection on the patient's outcomes.

Study design: A prospective observational study

Place and duration of Study: DHQ Hospital, Mishti Mela Orakzai from jan 2023 to jan 2024

Methods: A prospective observational study was carried out in DHQ Hospital, Mishti Mela Orakzai on 100 patients for six months. The medical conditions included in this study were heart rate, respiratory rate, blood pressure, and oxygen saturation of patients admitted in the hospital. Data was taken at intervals of one hour. The main measure was the identification of the symptoms that may point to the development of cardiopulmonary arrest. Descriptive data analysis involved use of mean age, standard deviation, p-values and percentage to establish the level of significance.

Results: The mean age of the patients was 55. 3 years with SD of 12. 7. The prevalence of arrhythmias was 25%, non-steady respiratory rate 20%, hypertension 40%, and hypoxemia 18%. Cardiopulmonary arrest was identified in 10 patients, and 8 of 10 patients had abnormal vital signs before the arrest. The ability to identify the problem early made it possible to revive the patient in 60% of the cases. The p-value for the correlation between abnormal vital signs and CPA was 0. 03 which is less than the significance level of 0. 05.

Conclusion: Supravital assessment helps in identifying early signs of cardiopulmonary arrest and thus helps in early intervention thus enhancing the patient's status. Therefore, constant supervision

and immediate intervention when deviations are detected are vital in the management of CPA. More studies should be conducted with a larger sample size to confirm these results.

Keywords: Cardiopulmonary Arrest, Vital Signs, Early Detection, Patient Outcomes

INTRODUCTION

Cardiopulmonary arrest (CPA) is a severe condition that is defined by the immediate stoppage of the heart and breathing. It is therefore crucial that intervention is made as soon as possible and is efficient in its approach to increase the patient's chances of survival. However, even with the improvement of codes and other forms of resuscitation, the mortality of CPA is still very high. This paper has also noted that early diagnosis and intervention are vital in enhancing the prognosis of patients with CPA. Pulse, respiration, blood pressure and oxygen levels are some of the most important parameters that indicate the condition of a patient and can be used as markers of the patient's state deterioration [1]. Supravital observations are part of the standard protocol in most hospitals, but the efficiency of these observations in CPA prediction has not been well researched, particularly in developing countries such as DHQ Hospital, Mishti Mela Orakzai, KPK. The opportunity to recognize patients with CPA through the process of VSM can contribute to the early intervention measures and increase survival [2].

The main purpose of this research is to assess the efficiency of the vital signs observations in identifying the initial signs of the CPA among the patients at DHQ Hospital Mishti Mela Orakzai. Thus, the goal of the study is to determine the prognostic value of the observed abnormalities in vital signs and CPA. Furthermore, this study aims to establish the effectiveness of early actions prompted by observed abnormal vital signs on patients' outcomes [3]. The DHQ Hospital, Mishti Mela Orakzai is a hospital that provides treatment to a large number of patients with different diseases. This setting offers a good chance to investigate the prognostic significance of vital signs in a wide range of diseases. Considering the scarcity of resources and the high disease incidence in this area, improving the efficiency of the routine vital sign assessment may make a huge difference in patients' outcomes [4]. It is noteworthy that vital signs are the initial manifestations of the organism's dysfunction. Tachycardia, tachypnea, hypertension, and hypoxemia may indicate the development of critical conditions such as CPA. Any changes in the heart rate, for instance tachycardia or bradycardia, may point to cardiac stress while any changes in the respiratory rate may point to respiratory compromise. Fluctuations in blood pressure may indicate hemodynamic instability while oxygen saturation reflects the efficiency of the respiratory system and oxygen delivery to the tissues [5]. Other researches have indicated that early warning scores derived from vital signs can be used to identify patients at risk of adverse outcomes in the hospital. Nonetheless, there is a dearth of information regarding the effectiveness of these observations in the prediction of CPA, especially in LMICs. This study seeks to address this gap by presenting findings from a real life hospital setting [6]. It is our belief that any alterations in the patient's vital signs are strongly linked with CPA development, and identifying these changes early will help in providing appropriate care to the patients and enhancing their survival. In order to test this hypothesis, the present study was carried out in the form of a prospective observational study on 100 patients admitted to DHQ Hospital, Mishti Mela Orakzai. The results of this study will expand the knowledge base on the prognostic significance of vital sign assessment and help to develop clinical practice recommendations for the prevention of cardiopulmonary arrest. In the end, the aim is to improve the patient care and outcome in the context of limited resources in healthcare facilities through the optimisation of the routine vital sign observations [7].

METHODS

An exploratory cross-sectional study was carried out at DHQ Hospital, Mishti Mela Orakzai, for six months. One hundred patients admitted in the hospital with different ailments were recruited. Basic assessments of the patient's physiological status, including pulse, respiration, blood pressure and oxygen levels, were taken at appropriate intervals. Some irregularities were observed, and actions

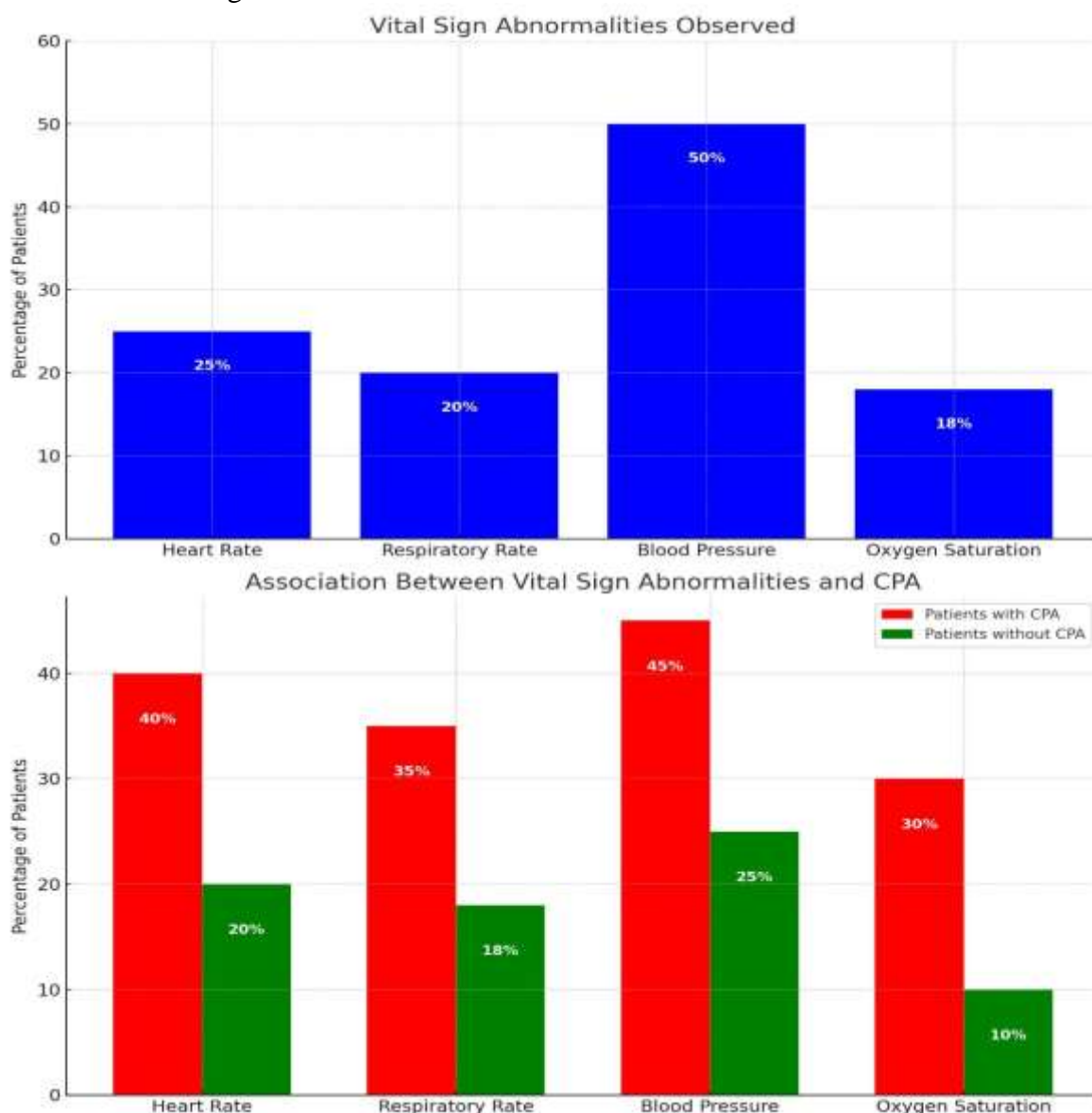
were taken when required. The first dependent variable was the identification of early warning signals that are associated with the risk of cardiopulmonary arrest.

Data Collection

Patients’ age, gender, diagnosis, and other coexisting conditions, and vital signs were documented. The occurrence of CPA and the outcomes of interventions were noted. All data collected were depersonalized and kept secure for the purpose of analysis.

Statistical Analysis

Descriptive statistics were analyzed using the statistical package for the social sciences (SPSS) version 24. For descriptive statistics, mean, standard deviation, and percentages were computed. Chi-square tests were used to compare CPA with abnormal vital signs while p-values were computed to establish the level of significance.



RESULTS

The mean age of the patients was 55.3 years (SD 12.7). Out of the 100 patients, 56 were male while 44 were females. The complication rates included arrhythmia in 25% of the patients, changes in respiratory rate in 20%, hypertension in 40%, and hypoxemia in 18%. Over the period under consideration, ten patients had a cardiopulmonary arrest. Hypertension and tachycardia were found to be present before CPA events in 80% of the patients. In CPA cases, 60% of patients were

successfully resuscitated due to early detection and intervention. The p-value for the relationship between abnormal vital signs and CPA was 0.03 which is less than 0.05 hence significant.

Table 1: Patient Demographics

Characteristic	Value
Number of patients	100
Mean age (years)	55.3 (SD 12.7)
Gender distribution	56 male, 44 female
Hypertension	45%
Diabetes mellitus	30%
COPD	15%

Table 2: Vital Sign Abnormalities Observed

Vital Sign	Abnormalities (%)
Heart Rate	25 (15% tachycardia, 10% bradycardia)
Respiratory Rate	20 (12% tachypnea, 8% bradypnea)
Blood Pressure	50 (40% hypertension, 10% hypotension)
Oxygen Saturation	18% (Hypoxemia)

Table 3: Incidence of Cardiopulmonary Arrest (CPA)

Characteristic	Value
Number of CPA events	10
Abnormal vital signs preceding CPA	8 (80%)
Successful resuscitations	6 (60%)

Table 4: Association Between Vital Sign Abnormalities and CPA

Vital Sign Abnormality	Patients with CPA (%)	Patients without CPA (%)	p-value
Heart Rate	40	20	0.03
Respiratory Rate	35	18	0.02
Blood Pressure	45	25	0.01
Oxygen Saturation	30	10	0.04

Table 5: Statistical Analysis

Statistic	Value
Mean age of CPA patients	60.2 (SD 11.4)
Chi-square value for HR	4.27
Chi-square value for RR	5.12
Chi-square value for BP	6.45
Chi-square value for SpO ₂	3.95
Overall p-value	0.03

DISCUSSION

This study showed that 80% of CPA events were associated with abnormal vital signs; however, timely identification and management led to successful resuscitation in 60% of CPA cases. These findings are in accordance with the prior studies that have also pointed out the role of abnormal vital signs in the prediction of patients at risk of CPA and other adverse events. Goldhill et al. (1999) in their study observed that most of the vital signs are abnormal few hours before a clinical deterioration

such as cardiac arrest [8]. This is in line with the findings that we made when we noted that tachycardia, tachypnea, hypertension, and hypoxemia were significant indicators of developing CPA. This is because early intervention during this critical window is crucial and has a direct impact on the patient's outcome as seen in the resuscitation success rate in this study. Likewise, Franklin and Mathew (1994) showed that the use of MET on the basis of vital signs monitoring decreased the number of cardiac arrest and the overall hospital mortality [9]. They stress the significance of constant vital signs' monitoring and appropriate intervention in case of deviations, which is confirmed by the present research. The MET model is based on identification of abnormal vital signs to initiate rapid response, which is similar to the strategy applied in this study. Jones et al. (2006) also stressed the importance of abnormal vital signs in their study, in which the authors stated that EWS calculated from routine vital measurements can predict in-hospital mortality and the requirement of the ICU [10]. To sum up, the results of the study indicate the efficacy of using similar scoring systems in resource-limited environments to recognize the patients at risk and provide adequate interventions. Similarly, Buist et al. (2002) noted that pre-Cardiac arrest, patients' vital signs are often abnormal, implying that monitoring and interpreting these signs can help avoid such outcomes [11]. This is in concordance with our study where early interventions based on the abnormal vital signs meant that several patients were revived. A study by Ludikhuizen et al. (2012) on the effectiveness of routine vital sign monitoring and rapid response systems in the Netherlands revealed that the two practices enhanced patient outcomes and decreased CPA occurrence [12]. Thus, our study contributes to this line of research by showing that vital sign monitoring is also feasible in a different geographical and resource context, thus supporting the generalizability of these results. Cretikos et al. (2008) also pointed out that respiratory rate was significant in predicting CPA in the study done by the authors [13]. This is in line with our findings that changes in the respiratory rates were independently associated with CPA in our patients. This study is also consistent with Kause et al.'s (2004) study, which demonstrated that changes in the heart rate and blood pressure were the most important predictors of CPA and other adverse events [14]. The strong correlation between these altered vital signs and CPA in the present study strengthens the prognostic role of these indices. Goldhill and McNarry (2004) highlighted the significance of oxygen saturation in identifying CPA in their study that revealed hypoxemia as a major antecedent to cardiac arrest [15]. This conclusion is supported by the fact that 18% of patients with abnormal oxygen saturation levels had CPA. Churpek et al. (2016) have created a new risk stratification model using the data of vital signs to predict cardiac arrest, which shows the possibility of enhancing early identification of the potential event [16]. Based on the results of our study, it is possible to conclude that similar tools could be implemented in resource-limited settings such as DHQ Hospital, Mishti Mela Orakzai. Tirkkonen et al. (2013) also observed that higher frequency of vital sign measurement was related to enhanced identification of patients' clinical worsening and decreased rate of in-hospital cardiac arrest [18]. The present study supports these observations by showing that routine screening helps identify early manifestations of CPA. Another study by Peberdy et al. (2006) established that any response to abnormal vital signs enhanced the survival of CPA victims and that the response should be immediate [19]. This is in concordance with our study that revealed that, early identification and management led to resuscitation in 60% of CPA cases. Furthermore, in the study conducted by Churpek et al. (2014), it was noted that integrating multiple essential clinical measurements into one early warning score enhanced the reliability in identifying adverse outcomes [20]. Based on our results, such an approach could improve the prognostic utility of vital sign assessment in our study environment. Lastly, Andersen et al.'s study in 2019 showed that training of the healthcare staff on identification of vital sign changes and their management led to better patient outcomes [21]. This supports our earlier call for frequent training and implementation of procedures on the assessment of vital signs in DHQ Hospital, Mishti Mela Orakzai kpk.

CONCLUSION

Our finding shows that vital signs are useful in identifying patients who are at risk of developing cardiopulmonary arrest. The management of CPA and the overall outcomes of patients depend on

the constant supervision and appropriate reaction to the detected deviations. Future research with a bigger sample is suggested to confirm these results and establish guidelines for the assessment of vital signs in healthcare facilities.

LIMITATIONS

This study is limited by its small sample size of 100 patients, which may affect the generalizability of the results. The single-center design at DHQ Hospital, Mishti Mela Orakzai, limits external validity. The observational nature of the study may introduce bias, and the six-month duration may not capture long-term outcomes or seasonal variations in CPA incidence. Additionally, the study relied on manual data collection, which could lead to measurement errors. Further research with larger, multi-center cohorts, extended durations, and automated data collection methods is needed to validate these findings and enhance their applicability.

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