



## Short Communication

# Alteration in Blood Stress Marker and Other Vitals of Saudi Medicos in Pre- and Post-Real Time Cardiac Catheterization Procedure

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## ABSTRACT

Present work is a prospective cohort study that deciphers the alteration in stress marker and blood profile among trainee medicos during pre and post cardiac catheterization procedure. Total 25 medicos were enrolled, only 10 were able to complete the criteria for the whole set of study, free from anxiety and were not on any medication before enrollment of study. Cortisol and white blood cells (WBC) count showed a significant difference in pre and post catheterization procedures. Significant ( $P \leq 0.05$ ) linear correlation was found between pre and post values for heart rate, WBC, electrolytes, blood urea nitrogen (BUN), cortisol, tri-iodothyronine, thyroxine, thyrotropin and Vit D in paired sample correlation. WBC counts measured before and after intervention were  $5.81 \pm 1.12$  and  $5.19 \pm 0.98$  respectively, which showed a significant fall in the WBC count and increase in cortisol after intervention. These alternations suggest to review and redesign the curricular or assigning duties to medicos under training.

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## Authors' Contribution

MMYA performed the experimental study. TA, WA, OA, SM, FAA and VK interpretate the biochemical data. FA designed the experimental study. All the authors proof read the manuscript.

## Key words

Cardiac catheterization, Blood profile, Cortisol, Electrolytes, BUN

Training and recruitment of highly qualified medical student is essential to ensure patient life and safety (Preece *et al.*, 2018). World Health Organization has reported that 37% in Saudi Arabia of total death are related to cardiovascular disease an alarming figure for Saudi Arabia ([https://www.who.int/nmh/countries/sau\\_en.pdf?ua=1](https://www.who.int/nmh/countries/sau_en.pdf?ua=1)). In medical education physicians and surgeons are often faced with some of most tough and critical time sensitive decision in assessment of the disease and in a complex clinical environment (Cate *et al.*, 2016). In order to gain the competency simulation technique is an attractive tool in surgical procedure especially in cardiac Catheterization labs (Wells *et al.*, 2006), but still it is matter of debate that such simulation can be valid scale to determine the competency of the clinical setting in medicos (Brydges *et al.*, 2015).

Cardiac catheterization first reported by Forssmann-Falck (1997) with first report documented in 1953 was one of the major breakthroughs in the field of medical science that helped in management of congenital heart disease (CHD) in the last century. This facilitated mechanistic approach to cardiac physiology along with varied pathophysiology of heart. A technique to measure pressure, oxygen, amount of blood pumped, or any other heart related defects. Coronary angiography is a part to know the blockage in the arteries that supply the blood to the heart muscle where small inflated balloon followed by small metallic tube called stent is placed to keep the blood vessel propped open (Schwarz *et al.*, 2018).

The young medicos often classified as generation Y born in between 1981-1999 are confident, pressured, team oriented and respectful (Borges *et al.*, 2010) but surrounded by technology and is multitasking (Evans *et al.*, 2016). Advancement of technology in medical and other allied medical field to some extent have relieved or ease out the job of medical interns and students (Nagra and Huntjens,

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2020) but the advancement in simulation techniques to increase the performance is now constantly growing (Cook *et al.*, 2014). Though there are reports that these simulation-based learning (Savoldelli *et al.*, 2006) helps in procedure skills (Couto *et al.*, 2015), and developing confidence for real time procedure (Bohnen *et al.*, 2018) that can result in improved patient health (Zendejas *et al.*, 2013). It is reported that activity pattern of physician or medicos is similar both in real time procedure and simulation procedure techniques (Manser *et al.*, 2007). Similar pattern was observed in acute team performance in real time procedure versus simulation technique procedure (Couto *et al.*, 2015). Real time catheterization may lead to fear in Medicos, (Kwan *et al.*, 2011). It can be stated and observed that multiple responsibilities, with additional catheterization, research, clinics, teaching and continues improvement to care the community have adverse effect, due to multiple involvement that include diversified role in health system is like to have impact on their real ability during the process of catheterization. Increase number of patients with decrease number of experts in catheterization is one the real factor and which is of great concern. Along with this there is increase number of administrative work increase the prevalence of CHD patients (Jones *et al.*, 2019). Catheterization process does not involve one specialist it involves multiple expert that further decrease the patient normal physiology and mental capacity of these medicos (Sen *et al.*, 2010). The thought for a better personnel and family life with ability to make themselves ready for next catheterization procedure can lead to change in normal vitals of these medicos that can even lead to medical error (Jonas, 2017). It is observed that the medicos or the professionals associated with such regress work load also have financial pressure compare to other jobs make them one of the most suitable working professional who are under tremendous strain to give best to the patients (Jayaram *et al.*, 2015). There is paucity of information in this area with incomplete methodology and limited application (Brydges *et al.*, 2015). To date much have been done on this simulation-based procedure carried out by trainee versus real time procedure but what is lacking is relationship between pre and post catheterization procedure and the alteration in stress marker during clinical training among the medicos.

#### *Materials and methods*

This is a prospective cohort pilot study from King Saud University College of Medicine. King Saud University Medical City, Riyadh and King Abdulaziz University, Jeddah. The study was approved by Institutional Review Board (IRB number. E-18-3448). Health Sciences Colleges Research on Human Subjects, King Saud University College of Medicine. All the fellows

enrolled in study were from King Saud University College of Medicine for the year 2019 (n=15) but only 7-fulfilled the criteria. Residents enrolled for study were informed and the consent to participate in study was obtained to record their biochemical blood profiling at pre and post cardiac catheterization procedure. The data was collected from the medicos who were willing to cooperate in the study without any prejudice. All the selected medicos were free from anxiety and were not on medication before going for the sample collection. The sample collection technique was followed with modification of resuscitation assessment tool (RAT) (Weersink *et al.*, 2019).

The medicos were subjected to cardiac catheterization procedure that helps them to diagnose and treat heart related problem. The medicos were allowed to relax and the blood sample were collected before going to catheterization lab. Once they were again relaxed the medicos were allowed to enter the cardiac catheterization laboratory to perform the real time catheterization technique under the supervision of expert. Once the cardiac catheterization procedure was over the medicos were allowed to relax for ten minutes and then the blood sample was again collected from them.

Standard Kits were utilized for analysis of blood profile with respect to HR, SBP and DBP WBC, RBC, HGB, PLT, CHOL, Na<sup>+</sup>, Cl<sup>-</sup>, K<sup>+</sup>, BUN, COR, FT3, FT4, TSH and VitD

The data were arranged and tabulated in Microsoft excel spread sheet. SPSS 18 was used to analyze the data. Normality was tested using Kolmogorov Smirnov test. Normally distributed continuous variables were presented as mean±SD and analyzed using paired' test.

Average or mean entrustment score were computed for each of the fellow trainee (FT) before and after the catheterization procedure. The outcome was compared using Pearson product movement correlation coefficient to determine the linear relationship between mean value in pre and post result data followed by t test to know any variation in the data of paired sample. Further, any internal reliability among the samples were calculated to observe any variation in the results of pre and post catheterization process (Weersink *et al.*, 2019). Any unwanted missing link or data were excluded from the study of analysis. All the samples were coded for using inductive thematic analysis (Attride-Stirling, 2001).

#### *Results and discussion*

The observation phase took almost a year to get the best results from the enrolled medicos. Out of 15 only 7 were able to fulfill the criteria of study. There was no statically significant variation in P-value > 0.05) between the medicos in terms age (36.6±6.9 year), weight (81.9±9.1 Kg) and height (174.7±7.6 cm).

Only cortisol and WBC count showed a significant difference in their values both in pre and post-catherization process carried out by the medicos (Table I).

A significant ( $P < 0.05$ ) linear correlation was found between pre and post values for HR (0.046), WBC (0.003), Na (0.045), Cl (0.001), K (0.036), BUN (0.007), COR (0.02), FT3 (0.018), FT4 (0.001), TSH (0.001) and VitD (0.012), (Supplementary Table I). There was a significant fall in the WBC a significant increase in the COR after intervention. Further results demonstrate the strong linear association adjusted with catherization process in accordance with the existing literature (Huh *et al.*, 2015), confirming the relationship as strong and consistent. Our results provide new insight on the usefulness of differential WBC count as predictors for stress in medicos.

**Table I. Vital parameters and blood profiling and vitals in pre and post catherization process.**

| Parameter            | Pre (Mean±SD) | Post (Mean±SD) |
|----------------------|---------------|----------------|
| HR (per min)         | 78.29±20.28   | 70.86±22.89    |
| SBP (mmHg)           | 126.14±14.18  | 122.57±12.51   |
| DBP (mmHg)           | 72.43±8.1     | 69.71±5.1      |
| SpO <sub>2</sub> (%) | 98.26±1.25    | 98.43±0.79     |
| HGB                  | 15.17±1.3     | 15.29±1.1      |
| WBC                  | 5.81±1.12     | 5.19±0.98      |
| RBC                  | 5.44±0.56     | 5.51±0.61      |
| PLT                  | 239.03±39.04  | 241.24±46.14   |
| CHOL                 | 5.3±1.12      | 5.39±1.32      |
| Na                   | 140.14±1.7    | 139.9±1.9      |
| Cl                   | 104.26±2.22   | 104.86±2.4     |
| Glu                  | 4.83±0.38     | 5.37±0.88      |
| Crea                 | 85±8.34       | 86.21±6.93     |
| BUN                  | 5.14±0.73     | 5.13±0.76      |
| K                    | 4.17±0.35     | 4.12±0.32      |
| COR                  | 261.57±110.94 | 342.98±122.29  |
| FT <sub>3</sub>      | 5.011±0.2     | 5.014±0.3      |
| FT <sub>4</sub>      | 13.4±2.22     | 13.34±2.01     |
| TSH                  | 2.12±0.63     | 2.05±0.63      |
| Vit D                | 42.07±9.83    | 38.65±6.77     |

WBC, white blood cells; TSH, thyrotropin; FT4, thyroxine; FT3, triiodothyronine; CHD, congenital heart disease; RAT, resuscitation assessment tool; Vit D, vitamin D; HR, heart rate; BUN, blood urea nitrogen; COR, cortisol; FT4, thyroxine; TSH, thyrotropin; SBP, systolic blood pressure; DBP, diastolic blood pressure; RBC, red blood cells; HGB, hemoglobin; PLT, platelets; CHOL, cholesterol; Na<sup>+</sup>, sodium ion; Cl, chloride ions; K<sup>+</sup>, potassium ions.

The alteration in the cortisol level may be associated

with mental fatigue. Our results are in concordance with the previous studies where mental fatigue associated with emotional stimuli (Watanabe *et al.*, 2019; Izawa *et al.*, 2017). The hectic job schedule and constant exposure to stress of patients can be another factor for the elevated level of cortisol (Simmons *et al.*, 2016).

### Conclusion

Present study clearly linked the alteration of cortisol association with mental fatigue of medicos, activities and training in their course of study. Rise in cortisol level is an indication of depressive symptoms that can lead to medical error. Stimulation studies can benefit the medicos before proceeding for real time cardiac catherization process with better output in terms of patient safety and medicos' health. Increase in WBC count is another parameter which have drastically altered in medicos after the process of catherization. Alteration in WBC is associated with normal cardiac activity of humans.

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### Supplementary material

There is supplementary material associated with this article. Access the material online at: <https://dx.doi.org/10.17582/journal.pjz/20200420160412>

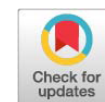
### Statement of conflict of interest

The authors have declared no conflict of interest.

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## Supplementary Material

# Alteration in Blood Stress Marker and Other Vitals of Saudi Medicos in Pre- and Post-Real Time Cardiac Catheterization Procedure

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**Supplementary Table I. A significant linear correlation was found between pre and post values for HR, WBC, Na, Cl, K, BUN, FT3, FT4, TSH and VitD.**

| Paired samples correlations |                             | N  | Correlation | Sig. |
|-----------------------------|-----------------------------|----|-------------|------|
| Pair 1                      | SBP (Pre) and SBP (Post)    | 10 | .753        | .051 |
| Pair 2                      | DBP (Pre) and DBP (Post)    | 10 | .675        | .097 |
| Pair 3                      | HR (Pre) and HR (Post)      | 10 | .762        | .046 |
| Pair 4                      | SPO2 (Pre) and SPO2 (Post)  | 10 | .024        | .959 |
| Pair 5                      | WBC (Pre) and WBC (Post)    | 10 | .926        | .003 |
| Pair 6                      | RBC (Pre) and RBC (Post)    | 10 | .982        | .000 |
| Pair 7                      | HGB (Pre) and HGB (Post)    | 10 | .976        | .000 |
| Pair 8                      | PLT(Pre) and PLT (Post)     | 10 | .979        | .000 |
| Pair 9                      | CHOL (Pre) and CHOL (Post)  | 10 | .990        | .000 |
| Pair 10                     | Na (Pre) and Na (Post)      | 10 | .765        | .045 |
| Pair 11                     | Cl (Pre) and Cl (Post)      | 10 | .946        | .001 |
| Pair 12                     | Glu (Pre) and Glu (Post)    | 10 | .572        | .180 |
| Pair 13                     | Crea (Pre) and Crea (Post)  | 10 | .250        | .588 |
| Pair 14                     | BUN (Pre) and BUN (Post)    | 10 | .894        | .007 |
| Pair 15                     | K (Pre) and K (Post)        | 10 | .786        | .036 |
| Pair 16                     | COR (Pre) and COR (Post)    | 10 | .827        | .022 |
| Pair 17                     | FT3 (Pre) and FT3 (Post)    | 10 | .840        | .018 |
| Pair 18                     | FT4 (Pre) and FT4 (Post)    | 10 | .951        | .001 |
| Pair 19                     | TSH (Pre) and TSH (Post)    | 10 | .961        | .001 |
| Pair 20                     | VitD (Pre) and Vit D (Post) | 10 | .909        | .012 |

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