Original Research

EFFECT OF DIETARY MODIFICATION AND EXERCISE IN CONTROLLING THE METABOLIC PROFILE AND STRESS ON EMERGENCY MEDICINE DOCTORS AND NURSES

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ABSTRACT

Background: Doctors and nurses working in emergency departments (EDs) face chronic occupational stress from long working hours, exposure to critical illness, and demanding clinical responsibilities, predisposing them to adverse metabolic outcomes. This study evaluated the effect of a structured dietary modification and exercise intervention on the metabolic profile and perceived stress of ED healthcare professionals.

Methods: A quasi-experimental, single-arm, pre-post study was conducted among 37 doctors and nurses (of 40 enrolled) in the Emergency Department of Believers Church Medical College Hospital, Thiruvalla, India, over 61 days. Participants were trained to abstain from refined sugar and processed food, use stairs instead of elevators, perform body-weight strength training, and walk briskly for 10 minutes daily. Weight, body mass index (BMI), random blood sugar (RBS), lipid profile, liver enzymes (SGOT, SGPT), serum cortisol, and Perceived Stress Score (PSS) were recorded at baseline and on day 61. Paired t-test or Wilcoxon signed-rank test was used for pre-post comparisons, and the Mann-Whitney U test for gender- and profession-wise comparisons.

Results: Significant reductions were observed in weight (73.08 to 69.08 kg), BMI (27.66 to 26.15 kg/m²), RBS (110.35 to 104.19 mg/dL), LDL, total cholesterol, triglycerides, SGOT, SGPT, serum cortisol (82.59 to 69.32 nmol/L), and PSS (25.59 to 12.05) (all $p<0.05$). SGOT and SGPT improved significantly more in males than females ($p=0.018$ and $p=0.007$, respectively); no other parameter differed significantly by gender or profession.

Conclusion: A short, structured dietary and exercise intervention significantly improved metabolic parameters and reduced perceived stress among emergency medicine doctors and nurses, supporting the feasibility of workplace-based lifestyle interventions for this high-stress workforce.

Keywords: Dietary Modification; Exercise; Emergency Medicine; Metabolic Syndrome; Occupational Stress; Hydrocortisone.

INTRODUCTION

Healthcare professionals working in emergency departments are routinely exposed to a uniquely demanding combination of life-threatening clinical scenarios, distressed patients and relatives, and organisational pressures. Such repeated exposure to high-acuity, high-stakes situations can erode physical, psychological, and emotional health over time.[1] An estimated 76% of emergency medicine residents report burnout, and more than 80% of emergency nurses describe moderate-to-high burnout alongside high levels of fatigue.[2,3]

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Diet quality is increasingly recognised as a modifiable determinant of mental as well as physical health. A pattern of poor dietary intake has been associated with obesity, type 2 diabetes, mood instability, and reduced productivity, whereas balanced nutrition is linked with greater psychological resilience and lower rates of depression. Resident physicians themselves report that their food choices affect how they feel and perform on shift, yet EDs often provide limited access to healthy food, and dedicated meal breaks during long shifts remain uncommon.[4]

A useful framework for occupational stress management distinguishes primary prevention (reducing risk factors before illness develops), secondary prevention (using nutrition, exercise, and

relaxation techniques to build resilience once stress is present), and tertiary prevention (clinical or psychological management of established distress). Workplace studies combining structured exercise with dietary counselling have shown greater improvements in weight and lipid profile than either intervention alone, particularly among female hospital staff.[5] However, little of this literature has focused specifically on doctors and nurses working in emergency medicine — a group whose rotating shifts, unpredictable workload, and high cognitive demand make them particularly vulnerable to both metabolic dysregulation and chronic stress. Unrecognised fatigue and stress in this group carries consequences beyond individual wellbeing, including attentional lapses and medical error.[6]

This study was designed to evaluate whether a short, structured programme of dietary modification and exercise could improve the metabolic profile — blood glucose, liver enzymes, and lipid parameters — and reduce perceived stress among doctors and nurses working in the emergency department of a tertiary-care teaching hospital in Kerala, India.

MATERIALS AND METHODS

Study Design and Setting

This was a quasi-experimental, single-arm, pre-post intervention study conducted in the Department of Emergency Medicine, Believers Church Medical College Hospital (BCMCH), Thiruvalla, Kerala, India, over a 61-day period commencing 1 February 2024.

Participants

All doctors and nurses working in the ED who provided informed consent were eligible for inclusion; staff from other departments were excluded. Of 40 ED staff approached by convenience sampling (reflecting the total ED staff strength at the time), 37 completed the full 61-day protocol and were included in the final analysis; three discontinued.

Intervention

Before the study began, participants received structured training on avoiding refined sugar and processed food and on a simple exercise routine feasible alongside ED shift work. The intervention package comprised: (i) abstinence from refined sugar and processed food; (ii) use of stairs instead of elevators; (iii) body-weight strength training (e.g., wall push-ups); and (iv) 10 minutes of brisk walking daily. Adherence was monitored through weekly review of self-maintained food and exercise logbooks, and a 24-hour dietary recall was used to characterise baseline eating habits.

Outcome Measures

Demographic data (gender, profession) were recorded at baseline. Anthropometric measures (height, weight, BMI) and biochemical parameters — random blood sugar (RBS), low-density lipoprotein (LDL), total cholesterol, triglycerides, serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), and random serum cortisol — were measured at baseline and again on day 61. Perceived stress was assessed using the Perceived Stress Scale (PSS) at both time points.

Statistical Analysis

Data were entered in Microsoft Excel and analysed using SPSS version 20.0. Categorical variables were summarised as frequencies and percentages; continuous variables as mean ± SD or median (interquartile range), depending on distribution, assessed using the Kolmogorov–Smirnov test. Paired pre-post comparisons used the paired t-test for normally distributed data (weight, BMI) or the Wilcoxon signed-rank test for non-normally distributed data. Gender- and profession-wise comparisons of the magnitude of change were performed using the Mann-Whitney U test. A two-tailed $p<0.05$ was considered statistically significant.

Ethical Considerations

The study was approved by the Institutional Ethics Committee, Believers Church Medical College Hospital (IEC Study No. IEC/2024/01/393, approved 10 January 2024). Written informed consent was obtained from all participants prior to enrolment.

RESULTS

Of the 37 participants who completed the study, 26 (70.3%) were doctors and 11 (29.7%) were nurses; 18 (48.6%) were male and 19 (51.4%) were female (Table 1).

Table 1: Demographic Profile of the Study Population (N=37)

Variable	Category	N	%
Profession	Doctor	26	70.3
	Nurse	11	29.7
Gender	Male	18	48.6
	Female	19	51.4

After the 61-day intervention, significant improvements were observed across all anthropometric, biochemical, and stress parameters measured (Table 2). Mean weight fell from 73.08 ± 15.6 kg to 69.08 ± 14.56 kg, and BMI fell from 27.66 ± 4.66 kg/m² to 26.15 ± 4.3 kg/m² (both $p<0.0001$). RBS decreased from 110.35 ± 25.09 to 104.19 ± 18.79 mg/dL ($p=0.012$). LDL, total cholesterol, and triglycerides all decreased significantly ($p<0.05$ for all), as did SGOT and SGPT ($p<0.0001$ for both).

Serum cortisol fell from 82.59 ± 21.9 to 69.32 ± 15.1 nmol/L, and Perceived Stress Score fell from 25.59 ± 5.87 to 12.05 ± 3.78 (both p<0.0001).

Table 2: Comparison of Metabolic and Stress Parameters Before and After the 61-Day Intervention

Parameter	Day 0 Mean±SD	Day 61 Mean±SD	Paired Difference Mean±SD	Test Statistic	P-Value
Weight (Kg)	73.08±15.6	69.08±14.56	4.00±2.08	T=11.68	<0.0001*
BMI (Kg/M²)	27.66±4.66	26.15±4.3	1.51±0.77	T=11.88	<0.0001*
RBS (Mg/Dl)	110.35±25.09	104.19±18.79	6.16±13.23	Z=2.507	0.012*
LDL (Mg/Dl)	125.38±31.68	107.84±25.29	17.54±17.01	Z=4.430	<0.0001*
Total Cholesterol (Mg/Dl)	226.76±54.22	171.70±35.97	55.05±41.17	Z=4.837	<0.0001*
Triglycerides (Mg/Dl)	153.14±27.19	145.78±17.33	7.35±26.67	Z=2.452	0.014*
SGOT (U/L)	79.89±28.72	46.00±9.17	33.89±26.96	Z=5.085	<0.0001*
SGPT (U/L)	73.84±28.03	44.86±8.49	28.97±24.5	Z=5.146	<0.0001*
Serum Cortisol (Nmol/L)	82.59±21.9	69.32±15.1	13.27±19.17	Z=3.781	<0.0001*
Perceived Stress Score	25.59±5.87	12.05±3.78	13.54±3.51	Z=5.315	<0.0001*

Paired t-test used for Weight and BMI; Wilcoxon signed-rank test used for all other parameters (non-normally distributed). *p<0.05 considered statistically significant.

When changes were compared by gender (Table 3), the reduction in SGOT and SGPT was significantly greater in males than females (p=0.018 and p=0.007, respectively). No other anthropometric, biochemical, or stress parameter differed significantly by gender.

Table 3: Gender-Wise Comparison of Change in Metabolic and Stress Parameters

Parameter	Male Mean±SD Change	Female Mean±SD Change	Test Statistic (U)	P-Value
Weight (Kg)	4.56±1.76	3.47±2.27	1.77	0.086
BMI (Kg/M²)	1.66±0.68	1.37±0.84	1.033	0.301
RBS (Mg/Dl)	6.72±15.18	5.63±11.48	0.137	0.891
LDL (Mg/Dl)	20.33±18.98	14.89±14.95	1.111	0.267
Total Cholesterol (Mg/Dl)	48.22±50.12	61.53±30.43	0.791	0.429
Triglycerides (Mg/Dl)	10.11±18.51	4.74±32.93	0.091	0.927
SGOT (U/L)	43.28±22.07	25.00±28.67	2.371	0.018*
SGPT (U/L)	37.72±18.69	20.68±26.87	2.692	0.007*
Serum Cortisol (Nmol/L)	17.39±22.65	9.37±14.75	0.867	0.386
Perceived Stress Score	13.72±3.85	13.37±3.25	0.445	0.663

Mann-Whitney U test. *p<0.05 considered statistically significant.

Comparison by profession (Table 4) showed no statistically significant differences between doctors and nurses for any parameter, although SGOT showed a trend toward significance (p=0.058).

Table 4: Profession-Wise Comparison of Change In Metabolic and Stress Parameters

Parameter	Doctors Mean±SD Change	Nurses Mean±SD Change	Test Statistic (U)	P-Value
Weight (Kg)	4.23±2.14	3.45±1.92	0.339	0.734
BMI (Kg/M²)	1.56±0.76	1.39±0.83	0.621	0.538
RBS (Mg/Dl)	5.92±13.95	6.73±11.93	0.350	0.727
LDL (Mg/Dl)	21.00±13.16	9.36±22.46	1.381	0.167

Total Cholesterol (Mg/Dl)	51.85±44.07	62.64±33.99	0.732	0.464
Triglycerides (Mg/Dl)	4.12±27.88	15.00±22.96	1.381	0.118
SGOT (U/L)	37.58±20.05	25.18±38.64	1.895	0.058
SGPT (U/L)	30.96±19.2	24.27±34.72	1.330	0.192
Serum Cortisol (Nmol/L)	16.50±20.12	5.64±14.81	1.663	0.096
Perceived Stress Score	13.58±3.6	13.45±3.45	0.302	0.763

Mann-Whitney U test.

DISCUSSION

This quasi-experimental, single-arm intervention study in the ED of a tertiary teaching hospital demonstrated that a brief, low-cost programme of dietary modification and exercise produced significant improvements across the full panel of metabolic parameters measured, alongside a significant reduction in perceived stress.

Weight and BMI fell significantly over the 61-day intervention ($p<0.0001$), consistent with prior workplace-based studies. Speroni et al. reported a significant reduction in weight and waist circumference among nurses enrolled in a combined exercise-and-nutrition programme.[7] An app-based dietary support tool was initially planned for this study but was not used because of confidentiality concerns regarding participant data; to our knowledge, no previous study has evaluated a dietary and exercise intervention specifically among doctors working in an emergency department.

RBS improved significantly after intervention ($p=0.012$), as did the lipid profile — LDL, total cholesterol, and triglycerides all fell significantly ($p<0.05$). These findings parallel those of Heath and Broadhurst, who found that combined exercise training and dietary modification produced greater improvements in weight and lipoprotein lipids than either intervention alone among female hospital employees.[5] Liver enzymes (SGOT, SGPT) also improved significantly ($p<0.0001$), in keeping with a systematic review and meta-regression by Gea Cabrera et al., which concluded that workplace-based interventions combining dietary change with physical activity — and accounting for workers' health beliefs and motivation — produced the most favourable effects on metabolic syndrome risk.[8]

Healthcare professionals in high-acuity settings often experience considerable emotional, physical, and mental fatigue arising from the complexity of care delivered and the intensity of patient need, compounded by demanding schedules and extended shifts.[6] To assess the impact of the intervention on physiological stress, serum cortisol was measured at baseline and on day 61, and fell significantly after the intervention ($p<0.0001$); PSS fell significantly over the same period ($p<0.0001$). The literature on cortisol as a stress biomarker in healthcare workers is mixed: Bardaquim et al. found elevated capillary cortisol in nearly half of nursing staff studied, consistent with the presence of stress, but could not demonstrate a statistically significant association between cortisol and perceived stress scores.[9]

Dunn et al. reported that the benefit of exercise on weight loss was more pronounced in men, while women achieved better results with a combination of dietary fat restriction and moderate-to-substantial exercise, suggesting dietary change may be the more effective lever for weight loss in women.[10] In the present study, the reduction in SGOT and SGPT was significantly greater in men than in women ($p=0.018$ and $p=0.007$, respectively); no other metabolic or stress parameter differed significantly by gender, suggesting that, aside from hepatic enzyme response, male and female ED staff responded similarly to the intervention.

Findings from broader populations support these results. Ohno et al. found that nutritional and physical-activity-based lifestyle modification significantly reduced insulin resistance, oxidative stress, and central blood pressure in people with metabolic syndrome.[11] Among emergency medical service providers specifically, Mansouri et al. described how high occupational stress and irregular shift patterns predispose to poor eating habits and reduced physical activity,[12,13] while Walhin highlighted the beneficial effect of exercise on metabolic control and systemic inflammation independent of overall energy balance.[14] Taken together, these findings support the feasibility of dietary and exercise interventions for controlling metabolic risk and stress among emergency medicine staff.

Limitations

This study has several limitations. It was conducted in the ED of a single tertiary centre using a single-arm, pre-post design without a concurrent control group, which limits causal inference and generalisability. Additional metabolic parameters such as waist circumference and blood pressure were not measured, which would have strengthened the anthropometric assessment. A larger, multicentre study — ideally with a control arm — would help confirm and extend these findings.

CONCLUSION

This study demonstrates that a brief, low-cost programme of dietary modification and exercise can significantly improve the metabolic profile and reduce perceived stress among doctors and nurses working in a high-pressure emergency department.

Given the unique occupational stressors faced by this workforce, structured lifestyle intervention protocols may be a feasible and valuable addition to efforts aimed at improving staff wellbeing and, by extension, patient care quality. Larger, multicentre, controlled studies are warranted to confirm these findings and guide implementation.

Conflict of Interest

The Authors Declare No Conflict Of Interest.

Source of Funding

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Ethical Approval

This Study Was Approved By The Institutional Ethics Committee, Believers Church Medical College Hospital, Thiruvalla (Iec Study No. Iec/2024/01/393, Approved 10 January 2024). Written Informed Consent Was Obtained From All Participants Prior To Enrolment.

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