Assessment of Anthropometry and Nutritional Status in relation to Perceived Stress of Policemen residing in Coimbatore

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Article info

Abstract

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The present study deals with the estimation of nutritional status and level of stress by anthropometric indices, physiological indices and perceived stress in randomly selected police volunteers aged 20-60 years from reserved policemen residing in Coimbatore, Tamil nadu, India. As many as 10 anthropometric traits viz. Height, weight, BMI, percent body fat, relative body weight, circumference of the upper arm during an isometric contraction and relaxed position of biceps brachii, circumference of thorax, circumference of abdomen and shoulder width were measured on all the subjects by standard techniques. Four anthropometric indices, viz. Quetlet's index (QI), Oliver's typologic index (OTI), Lorenz's constitutional index (LCI) and muscle index (MI) were derived from those anthropometric traits. Nutritional status was assessed by Food frequency and 24 hrs recall of food intake. Physiological indices like pulse rate, systolic and diastolic blood pressure and arterial pressure. Level of stress was evaluated by using Cohen's perceived stress questionnaire .One way ANOVA was tested followed by Duncan's post hoc test and Pearson's correlation coefficients were applied to analyze the data. In findings, the one way ANOVA showed that there is no significant difference stress among age categories, the anthropometric indices change from person to person and it was found to be that the age has great influence on BMI, percent body fat and other physiological indices, the nutrient intake through diet had no correlation with the anthropometric and physiological indices. The majority of the subjects were found to skip meals due to their improper timings of work, extended hours of work and shifts. None of the subjects were under-nourished and have BMI ranging above 19 and below 30. There was no significant difference noted in the Physiological Indices among the Age categories as well as BMI categories. From the findings of the current study, it may be concluded that BMI alone does not help in determining the body composition, so, the anthropometric indices were used in the study to know the body composition of the police personnel. All the Anthropometric measurements were found to have correlation with Anthropometric indices like, QI, OTI, and LCI except MI and stress is most common among all the police personnel.

Keywords: Nutritional status, Physiological indices, Anthropometric traits.

INTRODUCTION

The Indian Police Service is one of the three All India Services of the Government of India. The Indian Police Service is not a force itself but it provides leaders and commanders to staff the police and All India Central Armed Police Forces. Its members are the senior officers of the police.

The duties of police are to maintain public peace and order, crime prevention, investigation and detection, collection of intelligence, VIP security, railway policing, protection of environmental laws etc.

The police are the law enforcement personnel. They deal on a regular basis with an assortment of unique situations and stressors (Jahnavi et al, 2012) Increased demands of work impinging upon home life, lack of consultation and communication with the higher authorities in the organisation, lack of control over workload and inadequate support have been identified as the potential factors responsible for the stress in policemen (Collins et al, 2003, Gisli et al, 2003). Long working hours, irregular eating habits, sleepless nights, shift duties and disturbed personal life produces stress in the police officer's life and they become vulnerable to various disorders (Rakesh et al, 2013). The impact of an unhealthy or mentally impaired police officer has implications not only for the individual officer, but also for the society as a whole.

Initial recruitment process of a policeman includes both physical and mental fitness. But, as there is change in shifts, extended work hours, inappropriate health patterns, fatigue etc relatively may lead to stress which invades cardiovascular risks, mental stress, nutritional illness and deficiencies.

Often policemen are posted outside of their locality on duty for many reasons. In this kind of situations, the food provided to them may be insufficient, does not fulfil the nutritional requirement for a period of time. Insufficient, inappropriate nutrient intake for a longer period will lead to illness due to nutrient deficiencies. This may also lead to severe non- communicable diseases. So, at present, the lifestyle of any individual has greater impact on the health. The illness and diseases will recreate stress in the individual. All the factors which affect the individual's health are interconnected, but the effect will be purely on the health of the individual.

Police are at high risk of developing cardiovascular diseases due to work related stress (Czaja- miturai et al, 2013). With the increase in the burden of non- communicable disease risk factors in many countries, there is a need to identify the burden of stress and its associated factors among police personnel (Ganesh et al, 2015). A study show that majority of policemen had moderate level of stress. Stress score was significantly high among overweight, diabetes, hypertensive and depressed personnel (Kanble et al, 2003).

METHODOLOGY

The study carried out was an observational prospective, study where samples were chosen and evaluated for anthropometric data, physiological indices, food frequency, 24hrs Recall and stress was analysed by using a questionnaire.

A well structured questionnaire was used for the study. Questionnaire was composed with the set of questions, which helps to collect data of the selected participants. The questionnaire was partitioned into various sets of questions according to the data collected, namely:

Demographic data, Anthropometric data, Physiological Indices, Personal Habits, Food frequency, 24hrs- Recall and Cohen's Perceived Stress questions.

a) Demographic data: under demographic data, personal data or questions like name, age, marital status, rank, education status and work experience were asked orally to the subjects.

b) Anthropometric Data: Anthropometric data comprises of measurements like Height, Weight, Circumference of Biceps in Contraction (CCB), Circumference of Biceps in Relaxation (CRB), Circumference of Chest or Thorax (CT), Abdomen Circumference (CA) and Shoulder Width were measured using Stadiometer, digital scales and measuring tapes. All the measurements were measured on all the subjects using the standard techniques (Lohmann et al 1988).

1. Height: The height was recorded using a stadiometer (Holtain Ltd., Crymych, Dyfed, UK) to the nearest 0.1 cm

2. Weight: Weight was measured by digital standing scale to the nearest 0.1 kg. The subjects were told to stand bare footed and to stand straight.

3. Circumference of Biceps in Contraction (CCB): CCB is the Circumference of the upper arm during an isometric contraction of muscle biceps brachii at 90^0 of elbow flexion (cm).

4. Circumference of Biceps in Relaxation (CRB): CRB is the circumference of the upper arm in relaxed position of muscle biceps brachii at 90^0 elbow flexion (cm).

5. Chest Circumference (CT): The circumference of Chest is measured by using an inch tape.

6. Abdomen Circumference (CA): The abdomen circumference is also measured by using an inch tape by placing it around the abdomen region near the navel.

7. Shoulder Width (SW): The width of the shoulder is measured by using an inch tape.

The following body indices were derived and calculated from the anthropometric measurements by standard formula (Celan and Turk 2005):

Body Mass Index (BMI)

It is calculated using the formula weight (kg)/height2 (m) ^{2}. %BF was calculated standard formula (Womersely and Durnin et al, 1977). The American Heart Association's recommended guidelines following BMI values for the degree of nutrition are:

-BMI < 18.5 kg/m2 indicates under nutrition

-BMI 18.5 – 24.9 kg /m^2 indicates normal values

-BMI 25.0 – 30.0 kg /m^2 indicates hyper nutrition

-BMI 30.0 kg/m2 indicates obesity

-BMI 40.0 kg/m2 or more indicates extreme obesity

Quetelet's Index (Devenport-Kaup's adaptation)

Quetelet's index (QI) represents a measure of nutrition status. It is calculated according to the formula:

QI = BW/BH^2,

Where BW means body weight (g) and BH body height (cm). People with normal nutritional status have QI values between 2.15 – 2.56.

Relative body weight

Relative body weight (RBW) is another possibility to describe a nutritional status and uses the following formula:

RBW = (ABW / IBW) X 100,

Where ABW means measured body weight (kg) and IBW ideal body weight, formula is given below: Z

IBW = (BH – 100) – {(BH -150) / 4} + {(AY – 20) / 4},

Where AY means age (yrs) and BH body height (cm). The values ranging from 90-110 are representing normal nutritional status.

Muscle Index

Muscle index (MI) is an orientation method about someone's muscle development. It is calculated according to the formula:

MI = {(CCB – CRB) / CRB} X 100,

Where CCB means circumference of the upper arm during an isometric contraction of muscle biceps brachii at 90^0 of elbow flexion (cm) and CRB circumference of the upper arm in relaxed position of muscle biceps brachii at 90^0 elbow flexion (cm). Values ranging from 5 - 12 are normal, values under 5 represent obese subjects with weak muscle and values over 12 represent children with strong muscles.

Lorenz's Constitutional Index

Lorenz's Constitutional Index (LCI) gives information about body's components with a following formula:

LCI = CT – CA -14,

Where CT means circumference of thorax (cm) and CA circumference of abdomen (cm). If a calculated value is a positive, then an increase in a body mass goes on the account of muscles and bone. On contrary, if it's a negative then the adipose tissue is responsible for an increased body mass.

Olivier's Typologic Index

Olivier's Typologic Index (OTI) represents quick orientation measure about body constitution. It is calculated as below:

OTI = (SW / BW) X 100,

Where SW means shoulder width (cm) and BW body weight (kg). Values over 67 suggest aesthenic constitution, values from 58 – 67 muscular constitution and values under 58 picnic constitution.

c) Physiological Indices: The physiological indices which are assessed were:

% Body fat:

To check the %body fat, body fat analyser was used. The selected participant's height, weight and age were entered in the body fat analyser and the subject is made to stretch his both the hands and hold the body fat analyser by using the thumb fingers in order to get the accurate value of %body fat.

Mean Arterial Pressure

The mean arterial pressure was calculated using the procedure adopted by Sangeeta et al, 2009. It is calculated by using the following formula:

Mean Arterial pressure = Diastolic BP+1/3 Pulse pressure

Pulse Pressure

The pulse pressure was calculated using the procedure adopted by Sangeeta et al, 2009. It is calculated by using the following formula:

Pulse pressure = Systolic BP – Diastolic BP

Systolic and Diastolic Blood Pressure, Pulse rate

Systolic blood pressure, Diastolic pressure and Pulse rate were checked by using Digital Sphygmomanometer. For the collection of blood pressure data, the procedure adapted by Kirpa et al, 1995 was followed. Blood pressure was measured after a five minute period of rest, with the back supported and the legs uncrossed. Constrictive clothing is removed from the upper arm, and it was rested on a table at heart level. The blood pressure cuff was evenly and snugly applied around the upper arm above the elbow and readings were noted down.

d) Personal Habits

The selected police personnel were asked few questions related to their personal habits orally and the answer replied were recorded in the questionnaire.

e) Food frequency

The food frequency of the different food groups were listed in a table and the subjects were instructed to fill it accordingly.

f) 24hrs- Recall

The subjects were asked to recall the food items and their quantity consumed by them in the last 24 hrs or the previous day in order to know their caloric and other nutrients intake.

g) Stress- questionnaire

Stress was assessed by Cohen's Perceived Stress scale (Cohen et al, 1983) and classified into categories, namely low (0-11), average (12-15), high (16-20), and very high (21-40), based on the stress scores.

h) Diet Counselling

After assessing the anthropometric status, physiological indices, perceived stress and the food habit of police personnel, they were given diet counselling to keep up their health well and to lead a healthy life. Counselling was also given for Stress Management too with help of a qualified Psychologist.

RESULTS AND DISCUSSIONS
Distribution of Age Category among the selected volunteers

Sl.No	Category	Range (years)	Number of Subjects (%)
1	Category 1	20-30	29
2	Category 2	30-40	41
3	Category 3	40-50	20
4	Category 4	50-60	10

The above table depict the distribution of age category among the selected volunteers. The age was categorised into four groups i.e., Category 1with the range of 20-30years, Category 2 with the range of 30-40years, Category 3 with the range of 30-40years and Category 4 with the range of 50-60years. Among the selected volunteers 29% of them were found to be grouped under category 1, 41% of them are under category 2, 20% of them fell under category 3 and 10% of them are under category 4.

Relative Body Weight of Selected volunteers

Sl.No	Category	Range	Number of Subjects (%)
1	Category 1	>110 (Over Nutrition Status)	51
2	Category 2	< 90 (Under Nutrition)	10
3	Category 3	90-110 (Normal Nutrition Status)	39

The above table narrate the relative body weight of the selected volunteers of policemen. The relative body weight is the possibility to describe the nutritional status of the individuals (Shyamal koley et al 2013).

The subject's Relative Body Weight value ranging above 110 are known to be over nutritional status and are found to be grouped under category 1, below 90 is known to be under nutrition and are found to be grouped under category 2 and the normal nutrition status ranging from 90-110 are found to be grouped under category 3. Of the total selected police personnel, 51% of them were with over nutritional status, 10% of them were under nourished and rest of the 39% of volunteers were normally nourished.

Distribution of anthropometric indices category among the volunteers

Sl.No	Indices	Category	Range	Interpretation	Number of Subjects (%)
1	Quetlet's Index (QI)	Category 1	>2.56	Over Nutrition Status	46
		Category 2	<2.15	Under-Nutrition Status	10
		Category 3	2.15-2.56	Normal Nutrition Status	44
2	Olivier's Typologic Index (OTI)	Category 1	<58	Picnic Constitution	38
		Category 2	>67	Aesthenic Constitution	15
		Category 3	58-67	Muscular Constitution	47
3	Lorenz's Constitutional Index (LCI)	Category 1	Negative	Increased mass is due to Adipose tissue	70
		Category 2	Positive	Increased mass is due to bone and muscles	30
4	Muscle Index (MI)	Category 1	<5	Obese Subjects	85
		Category 2	5-12	Normal Subjects	15
		Category 3	>12	Subjects with Strong Muscles	0

The table render the different indices like Quetlet's index (QI), Oliever's Typologic Index (OTI), Lorenz's Constitutional index (LCI) and Muscle Index (MI) were calculated using the anthropometric characteristics.

Quetlet's index.(Davenport, CB and Love, AG et al 1921) represents a measure of nutritional status; it is grouped into three categories. Of the total subjects 46% of them lie under category 1 who have over nutritional status which is above the normal range, 10% of the selected volunteers were found to be fell under category 2 who were found to be under nourished ranging below the normal level and rest of the 44% of subjects are with normal nutritional status ranging from 2.15-2.56.

Oliever's Typologic Index represents quick orientation measure about body constitution (Celan D, Turk Z et al. 2005).It has been grouped into three categories; out of the total participants 38% of total participants had picnic body constitution (Body constitute of more fat) and lie

under first category, 15% of total participants had aesthenic constitution (slender build and slight muscular development) who lie under second category and rest of the 47% of total subjects had muscular body constitution and they fell under third category.

Lorenz's Constitutional index gives information about body's components (Celan D, Turk Z et al. 2005). There are two criteria, the negative result implies that the individual's body mass is increased due to adipose tissue and the positive result implies that the individual's increased body mass is due to bone and muscles. In the present study, 70% of total participants were found to be grouped under category 1 with negative result and rest of the 30% of total participants were found to be grouped under category 2 with positive result.

Muscle Index is an orientation method about someone's muscle development (Celan and Turk et al. 2005). Individuals were grouped into three categories based upon their muscle index. The category1 had 85% of total subjects who had the muscle index less than 5 and were said to be obese. 15% of total subjects had normal muscle index with values ranging from 5-12 and none of the subjects lie under the third category.

Distribution of BMI Category among selected volunteers
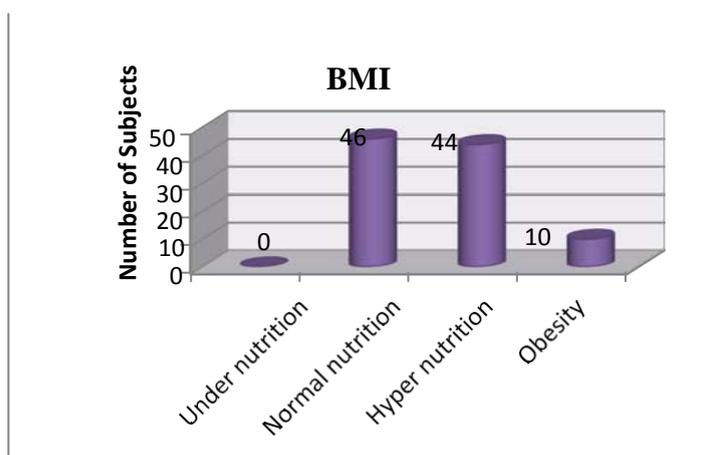
The above figure portray the distribution of Basal Metabolic Index category of the selected volunteers. Among the selected volunteers 46% of them were with normal nutrition and were grouped under category 2, 44% of them were with hyper nutritional status and were grouped under category 3 and the remaining 10% of total volunteers were obese and were grouped under category 4.

Categorization of selected volunteers with regard to Physiological Indices
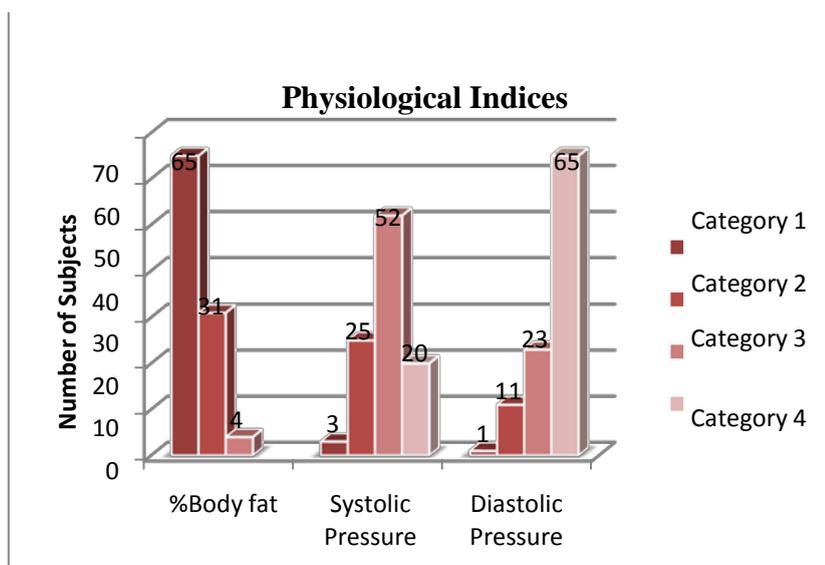
The above graph depicts the categorization of selected volunteers with regard to physiological indices. In the present study the physiological indices included were % body fat, Systolic Blood Pressure, Diastolic Blood Pressure, Pulse rate, Pulse pressure and Arterial Pressure.

%body fat was categorised into 3 categories. Among the selected volunteers 65% of them fell under the obese category with %body fat more than 25%, 31% of them lie under the average category with %body fat ranging 18-24% and rest of the 4% were categorised in the third category and are found to be fit.

Blood Pressure is the ratio of Systolic pressure and Diastolic pressure, and the unit of measure is mmHg. Both Systolic and Diastolic pressure was grouped into four categories i.e., Normal, Pre hypertensive, Stage-1 hypertension and Stage-2 hypertension. When Systolic blood pressure is considered, most of the selected volunteers fell under Stage-1 hypertension (52%), 25% of the selected volunteers were pre-hypertensive, 20% of them were found to be grouped under Stage-2 hypertension category and rest of the 3% were found to be normal.

But when Diastolic pressure was considered 65% of the selected participants were found to be normal, 23% of them were found to be Pre-hypertensive, 11% were found to be lie under category 2 with stage-1 hypertension and only 1% fell under the category of stage-2 hypertension.

Distribution of Stress Category among selected volunteers

The bar graph illustrates the Distribution of Stress Category among the volunteers. When compared to the other occupations, police job is considered highly stressful and stress is an integral part of the life of professional police officers (Burke RJ et al, 1993 Gul Z, Delice M et al, 2011). Cohen's Perceived Stress Scale (Cohen S, Kamarck T, Mermelstein R et al 1983) was used to interpret the level of stress among the policemen. In the present study also majority of the policemen (55) are grouped under Severely Stressed Category, 35 of the selected volunteers are stressed, 6 of them are moderately stressed and rest of the 4 volunteers are not stressed.

Ganesh et al, 2015 in his study entitled "An assessment of perceived stress among police personnel in puducherry, India" found that about two-thirds of the police personnel belonged to the age group of 25-39 years (68.2%). About 56.1% of the police personnel were designated as police constables. Majority of the police personnel had high and very high levels of stress (83.8%).

Distribution of Personal Habits of selected volunteers
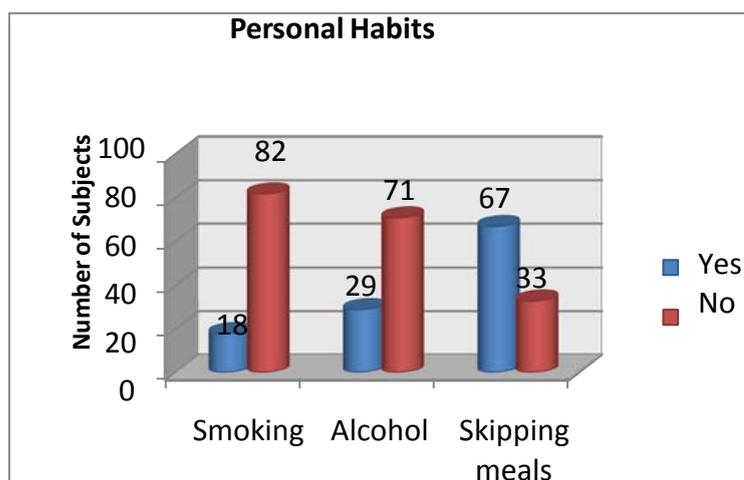
The above figure portrays the Distribution of Personal habits of Selected Volunteers. Personal habits were distributed into two categories i.e., Smokers and Non-smokers, Alcoholic and Non-alcoholic and whether they skip meals or not. These personal habits will lead to develop Cardio vascular risks, Diabetes, Hypertension and also oxidative stress.

In the present study, among the selected participants 18% of them were smoker and rest of the 82% of total volunteers are non-smokers.29% of the policemen were alcoholic and rest of the 71% volunteers are non alcoholic. Majority of the selected volunteers (67%) skip meals

due to shifts and extended work hours and rest of the 33% volunteers manage to avoid skipping meals.

Correlation of different Anthropometric Measurements

Parameters	Height	Weight	CCB	CRB	CT	CA	SW
Height	1						
Weight	.277**	1					
CCB	.232*	.715**	1				
CRB	.218*	.679**	.983**	1			
CT	.169	.867**	.669**	.650**	1		
CA	-.007	.850**	.519**	.492**	.816**	1	
SW	.274**	.645**	.523**	.482**	.596**	.523**	1

**, Correlation is significant at the 0.01 level.

*, Correlation is significant at the 0.05 level.

The above table portrays the correlation of anthropometric measurements. The parameters selected for the correlation of anthropometric measurements were height, weight, (CCB) Circumference of Biceps in Contraction , (CRB) Circumference of Biceps in relaxation, (CT) Chest circumference, (CA) Abdomen Circumference and (SW) Shoulder Width.

Weight is correlating with Height at 0.01% level of significance (r=0.277**) as both the factors are dependable on each other. (CCB) Circumference of Biceps in Contraction has positive correlation with Height (r=0.232*) as well as weight (r=0.715**) at 5% and 1% respectively.

In the similar way, (CRB) Circumference of Biceps in Relaxation is also correlating with Height (0.218*) at 5% significance, Weight (0.679**) at 1% significance and CCB (0.983**) at 1% significance level. Generally there is no much difference noticed in the circumference of Biceps in both Contraction and Relaxation and the mean of Circumference of biceps in contraction (CCB):32.93±3.12, Circumference of Biceps in relaxation (CRB):31.95±3.10

Circumference of Chest (CT) was found to be having significant relation with Weight (r=0.867**), CCB (r=0.669**) and CRB (r=0.650**) at 1% as the factor Chest Circumference depends on the Body Building factors like weight, Biceps Circumference, lean mass and adiposity. Similarly positive correlation was found between Abdomen Circumference (CA) and weight (r=0.850**), CCB (r=0.519**), CRB (r=0.492**) and CT (r=0.816**) at 1% significance level.

Whereas Shoulder Width which depends on all the factors which contributes to the body built has shown positive relationship with Height (r=0.274**), Weight (r=0.645**), CCB (r=0.523**), CRB (r=0.482**), CT (r=0.596**) and CA (r=0.523**) at 1% significance level.

Correlation of Anthropometric and Physiological Indices

Parameters	QI	OTI	LCI	MI	%Body fat	BMI
QI	1					
OTI	-.846**	1				
LCI	-.610**	.495**	1			
MI	.080	.003	-.112	1		
%Body fat	.728**	-.654**	-.721**	.085	1	
BMI	1.000**	-.846**	-.610**	.080	.728**	1

**, Correlation is significant at the 0.01 level.

*, Correlation is significant at the 0.05 level.

The above table illustrates the correlation of biological indices (QI, OTI, LCI and MI) with Physiological Indices (%Body fat and BMI).

Olivier's Typologic Index (OTI) is found to have negative correlation with Quetlet's Index (QI) (r= -0.846**) at 1% significance level. Lorenz's Constitutional Index was also found to be inversely correlating with QI (r= -0.610**) at 1% significance level. From the data obtained it can be inferred that the nutritional status is inversely correlating with body constitution i.e., the nutritional status of the selected participants is affecting the body constitution negatively.

Whereas, LCI has positive correlation with OTI (r=0.495**) at 1% significance level. Similarly % body fat is found to have positive correlation with QI (r=0.728**) at 1% significance level, QI depends on the %body fat factor as body is composed of fat also. Whereas %body fat is negatively correlating with OTI (r= -0.654**) and LCI (r= -0.721**) at 1% significance level.

BMI was found to have positive correlation with QI (r=1.00**) and %body fat (r= 0.728**) as the body is composed of fat, it contributes in both BMI and QI. Whereas, BMI has inversely correlated with OTI (r= -0.846**) and LCI (r= -0.610**) at 1% significance level. Muscle Index (MI) was found to have no correlation with any of the parameters.

Correlation of Nutrient intake with Physiological Indices

Parameters	Energy	CHO	Protein	Fat	%Body fat	OTI	BMI
Energy	1						
CHO	.168	1					
Protein	-.017	.023	1				
Fat	.030	.102	-	1			
%Body fat	-.004	.038	.09	-.166	1		
OTI	.085	.070	-	.071	.654**	1	
BMI	.032	-.067	.117	-.105	.728**	.846**	1

Correlation is significant at the 0.01 level.

*, Correlation is significant at the 0.05 level.

The above table renders the correlation of Nutrient intake with that of Physiological indices of the selected participants in the study. Positive correlation was found among OTI and % Body fat (r= 0.654**) at 1% significance level.

Similarly positive correlation was also noted between BMI and %Body fat (r=0.728**) at 1% significance level. Positive correlation was also seen between BMI and OTI (r=0.846**) at 1% significance level. Positive correlation was seen among these factors as the body fat percent contributes its role in body composition. There was no significance between any of the nutrients with Physiological Indices.

Correlation of Age with Physiological indices and Stress

Parameters	Age	Systolic pressure	%Body fat	Diastolic pressure	BMI	Pulse rate	Pulse pressure	Arterial pressure	stress
Age	1								
Systolic pressure	.199*	1							
%Body fat	.677**	.323**	1						
Diastolic pressure	.291**	.657**	.414**	1					
BMI	.432**	.409**	.728**	.482**	1				
Pulse rate	.018	.172	.067	.393**	.110	1			
Pulse pressure	-.036	.596**	-.033	-.141	-.015	-.197*	1		
Arterial pressure	.188	.488**	.212*	.561**	.196	.276**	.095	1	
Stress	-.061	-.072	.023	.015	.071	-.079	-.094	-.059	1

**, Correlation is significant at the 0.01 level.

*, Correlation is significant at the 0.05 level.

The above table portray the correlation of Age between Physiological indices and Stress. As the age increases there will be physiological changes as well as biological changes in every common individual. So, as the age increases changes can also be seen in Physiological indices. Some of such changes were reported in the current study which shows correlation of age with certain physiological indices. As the age increases, the muscle get thickens which may lead to high blood pressure, so, positive correlation was seen in between Systolic

pressure with age ($r=0.199^*$) at high significance level of 5%.

Whereas %body fat also had positive correlation with age ($r=0.677^{**}$) as well as Systolic pressure ($r=0.323^{**}$) at 1% significance level. Diastolic pressure was also found to have positive correlation with age ($r=0.291^{**}$), Systolic pressure ($r=0.657^{**}$) and %body fat ($r=0.414^{**}$) at 1% significance level.

BMI was found to be significantly correlated with that of age ($r=0.432^{**}$), Systolic pressure ($r=0.409^{**}$), %body fat ($r=0.728^{**}$) and diastolic pressure ($r=0.482^{**}$). Whereas pulse rate was found to have correlation with Diastolic pressure ($r=0.393^{**}$) at 1% significance level.

Similarly pulse pressure was found to have highly significant inverse correlation with pulse rate (r= -0.197[**]) and direct correlation was seen with Systolic pressure (r=0.596[**]) at 1% level. Arterial Pressure was found to be highly significant with %body fat (r=0.212[*]), whereas, arterial pressure has also significantly positive correlation with Systolic pressure(r=0.488[**]), Diastolic pressure (r=0.561[**]) and pulse rate (r=0.276[**]). Stress was not found to be correlated with any of the physiological indices and also with age.

Comparison of Anthropometric Indices based on Age Category

Parameters	Mean±SD			
	Age Category 1	Age Category 2	Age Category 3	Age Category 4
QI	2.34±0.29[a]	2.51±0.32[a]	2.71±0.30[b]	2.83±0.29[b]
OTI	64.17±6.39[b]	59.86±5.75[a]	56.72±5.95[a]	56.03±6.20[a]
LCI	-0.51±4.29[c]	-2.48±5.41[c]	-8.47±4.35[b]	-13.5±5.19[a]
MI	3.00±1.55[a]	2.89±2.19[a]	3.08±1.49[a]	4.49±2.02[b]
BMI	23.44±2.91[a]	25.11±3.27[a]	27.14±3.09[b]	28.33±2.96[b]

*Similar alphabetic superscripts refer to no significant difference. Different alphabetic superscripts refer to significance difference among the roups.

ANOVA was carried out to find the mean difference between age categories with Anthropometric Indices.

Duncan's Post Hoc test revealed that age category 1 and 2 are similar and is significantly different from age category 3 and 4 in case of both Quetlet's Index (QI) and Body Mass Index (BMI). Whereas, the mean Olivier's Typologic Index (OTI) of age category 1 was found to be significantly different from the category 2, 3 and 4 and the age category 2, 3 and 4 were found to be similar in their mean OTI.

The Lorenz's Constitutional Index, an anthropometric index which is used to find the body constitution of the individual. The mean LCI of age category 1 and 2 were found to be similar and has no significant difference in it, whereas, the age category 3 and 4 were noted to have significant difference when compared with age category 1 and 2.

In case of Muscle Index (MI) the mean and standard deviation of age category 1, 2 and 3 were found to have no significance, but the mean and standard deviation of age category 4 is found to be significant from the other 3 age categories.

Comparison of Physiological Indices based on Age Category

Parameters	Age Category 1	Age Category 2	Age Category 3	Age Category 4
Mean±SD				
% Body fat	22.71±4.41[a]	26.09±4.24[b]	30.46±3.29[c]	34.82±5.41[d]
Systolic Pressure	126.89±12.46[a]	132.43±14.46[a]	136.55±14.09[a]	133.90±17.76[a]
Diastolic Pressure	70.24±8.04[a]	78.46±10.85[b]	82.05±7.85[b]	78.10±11.00[b]
Pulse Rate	80.79±11.61[a]	81.24±13.22[a]	78.95±10.30[a]	84.00±13.74[a]
Pulse Pressure	57.41±8.89[a]	53.90±11.50[a]	54.50±9.79[a]	55.80±14.29[a]
Arterial Pressure	89.37±8.66[a]	90.72±22.48[a]	100.21±9.27[a]	96.70±11.85[a]

*Similar alphabetic superscripts refer to no significant difference. Different alphabetic superscripts refer to significance difference among the groups.

The physiological indices are the predictors of mortality and longevity (Alexander M. Kulminski et al, 2009). When Physiological indices are compared with age category of the selected individuals, the Duncan's Post Hoc test revealed that the mean % body fat among the age category is highly significant from each other. It is also found that the mean %body fat is increasing from age category 1 to 4. Hence it can be concluded that as the age increases the body composition changes and %body fat increases due to lesser physical activity, abnormal food habit, stress etc.

Whereas, the mean Systolic blood pressure, pulse rate, pulse pressure and arterial pressure does not show any kind of significance among the age categories.

The mean Diastolic pressure of age category 1 is found to be significant from age category 2, 3 and 4. Whereas, it was found in the current study that age category 2, 3 and 4 are not significant from each other.

In this line, Mariammal et al, 2012 found in her study that systolic blood pressure, diastolic blood pressure, pulse rate, pulse pressure and arterial pressure showed an increased status than the normal control population. When compared to the office workers, all the studied parameters showed a significant increase among teachers.

Cartwright and Cooper et al postulate that when an individual is confronted with a challenging situation, tension or pressure, the sympathetic nervous system can be triggered to activate a wide variety of hormonal secretions. The hypothalamus, when it identifies danger, triggers the pituitary gland to release hormones that cause the adrenal glands to increase its secretion of several hormones, including cortisol which provides more energy to the body, epinephrine which increases both the rate and strength of the heart's contractions and raises blood pressure and norepinephrine, which similar to the body's sympathetic nervous system, acts as the body's fight or flight system whenfaced with emergencies. Chronic work stress and exhaustion is associated with higher allostatic load in female school teachers. The raise in blood pressure and other related parameters observed among the teachers and office workers   in   the   present   study

maybe also because of the said physiological and hormonal changes that are triggered by their working environment.

Comparison of Physiological Indices based on BMI Category

Parameters	Mean±SD			
	BMI Category 1	BMI Category 2	BMI Category 3	BMI Category 4
% Body fat	-	23.34 ± 4.04^a	28.57 ± 4.44^b	35.45 ± 3.85^c
Systolic Pressure	-	127.67 ± 14.68^a	133.81 ± 11.48^{ab}	141.90 ± 18.81^b
Diastolic Pressure	-	72.02 ± 9.48^a	80.25 ± 9.62^b	83.20 ± 8.84^b
Pulse Rate	-	79.80 ± 11.97^a	80.93 ± 10.92^a	86.10 ± 17.50^a
Pulse Pressure	-	56.13 ± 10.15^a	54.15 ± 9.43^a	55.80 ± 17.76^a
Arterial Pressure	-	90.73 ± 10.15^a	92.98 ± 21.71^{ab}	101.80 ± 10.81^b

*Similar alphabetic superscripts refer to no significant difference. Different alphabetic superscripts refer to significance difference among the roups

ANOVA was carried out to find the significant mean difference of Physiological indices based on the BMI category.

Duncan's Post Hoc test reveals that the mean % body fat is highly significant among the BMI category. So, it was noticed that as the BMI increases along with the age the % body fat also increases along with the body composition.

Whereas, Systolic pressure of BMI category 2 differs from the BMI category 4, but the BMI category 3 is found to be similar to that of BMI category 2 and 4. Similarly, the arterial pressure was found to have significant difference among BMI category 2, 3 and 4, but the BMI category 3 is similar to that of BMI category 2 and 4.

Generally as the age increases, the %body fat increases which might lead to atherosclerosis, so as there is increase in the BMI, there is significant change in the %body fat. Probably this is the reason why there is a significant difference of %body fat among the BMI categories. The mean Diastolic pressure of BMI category 2 is found to be different from BMI category 3 and 4. There was no significance in the mean pulse rate and pulse pressure among the BMI categories.

CONCLUSION

It may be concluded that BMI alone does not help in determining the body composition, so, the anthropometric indices were used in the study to know the body composition of the police personnel. All the Anthropometric measurements were found to have correlation with Anthropometric indices like, QI, OTI, and LCI except MI and stress is most common among all the police personnel.

Though Police Personnel were found to have improper nutritional status because of their extended work hours and shifts and were found to be more stressed and face both mental and physical problems in their life due to job as well as family, yet serve the people and government with selflessness. It would be better to give counselling on dietary practices and stress management in order to lead a healthy life.

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