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Research Article

HEMATOLOGICAL, BIOCHEMICAL AND PSYCHOLOGICAL EFFECTS OF A YOGA TRAINING PROGRAMME IN NURSING STUDENTS

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Abstract: Background: We were granted the opportunity to impart a 6 month comprehensive course of yoga training for nursing students. The aim of this study was to analyse the effects of the training on the participants´ health and quality of life (QoL) **Materials and Methods**: 60 healthy nursing students (12 M, 48 F) aged 18.60 ± 0.67 (SD) y were recruited, and 60 min of yoga training was given twice weekly, for 6 months. Selected biochemical and hematological parameters were recorded along with Ferrans and Powers QoL index before and after the training period. QoL was also tested at mid term. Because we were not able to establish a separate control group, we correlated changes with the subjects´ frequency of attendance. **Results**: Post-intervention statistical analysis (repeated measures of ANOVA) revealed highly significant and beneficial changes in most hematological and biochemical parameters. Major findings are enhanced bone marrow function, reduced allergic tendency, alkalization of urine, metabolic reconditioning (with special emphasis on liver function) and improvement in all QoL indices. These changes correlated positively with the subjects´ frequency of attendance, as evidenced by Pearson's linear correlation testing. There were also significant improvements in QoL index and its subscales, both at mid training and post training. These improvements also correlated positively with attendance. **Conclusion**: The present study provides evidence of the beneficial psychological and physical effects of yoga training amongst graduate nursing course students . We suggest that yoga be made an integral part of medical and paramedical collegiate education.
Key words: psycho-physical health, quality of life, yoga

INTRODUCTION

Holistic health, integrative treatment and mind–body medicine are some of the current buzz words in health care. Integrative medicine is gaining in popularity and, here, yoga has the potential to make a significant contribution. The art and science of yoga has been practised for thousands of years. Recently, numerous scientists have studied its effects and reported consistent, beneficial physiological and psychological changes. [1-10] Yoga may be considered the original mind-body medicine; its philosophy and practice are highly effective in producing psycho-somatic and somato-psychic re-integration. Yoga improves mood and reduces stress by emphasizing every-moment body awareness involving attentional focus on one's breathing, emotions, thoughts or specific parts of the body. [11] These responses may be mediated by frontal lobe structures, whose physiological markers, such as reaction time, have shown improvement in short-term and long-term yoga training programmes. [1,5,10]

Practitioners of yoga claim that it provides one of the best means for self-improvement and enables the manifestation of one's highest physical, mental, emotional and spiritual potential. Such improvements in mental and emotional well-being enhance one's ability to manage stress. This has been documented in normal volunteers and patients suffering from lifestyle disorders. [12,13] It has been suggested that yoga enhances mood, balances emotions and modulates activity of hypothalomo-pituitary-adrenal (HPA) axis. [3,4,14] It reduces allostatic load in stress response systems, restoring optimal homeostasis by normalizing parasympathetic nervous system and GABA under-activity.[15] Another recent study detailed the psychophysiological benefits of Yoga training in a paramedical student population, reporting improvements in anthropometric, cardiovascular and neurological parameters, coupled with positive changes in heart rate variability (HRV) and Quality of Life (QoL) indices, signifying a healthier state of body and mind. [16]

Authorities of Kasturba Gandhi Nursing College requested the authors to impart yoga training to students enrolled in their Bachelor of Nursing course. This opportunity was used to study hematological, biochemical and QoL indices, in order to help students understand the effects of their yoga training and to scientifically validate those effects.

MATERIALS AND METHODS

Sixty apparently healthy nursing students (12 M, 48 F), aged 18.60 ± 0.67 (SD) years, who were novices to yoga took part in the present study after granting informed

consent. Because yoga training was part of their co-curricular activity, we devised a 6-month comprehensive training programme. The programme was delivered in twice-weekly, 60 min sessions and included the following components:

1. Brief theory of yoga and its practices and their benefits.
2. Jathis (loosening practices) and kriyas (breath-body coordination practices).
3. Surya namaskar (sun salutation) with breath awareness.
4. Yogasanas (postures): trikona (triangle), nataraja (cosmic dancer), veera–I, II & III (warrior), vriksha (tree), pashchimottana (posterior stretch), purvottana (anterior stretch), chatushpada (four footed), ushtra (camel), matsya (fish), janushirasa (head to knee), vakra (twist), ardhamatsyendra (half twist), makara (crocodile), bhujanga (cobra), shalabha (locust), dhanura (bow), pada-uttana (leg lift), pavana mukta (wind releasing), viparitakarani (topsy-turvy), hala (plough), sarvanga (pan limb) and shava (corpse) asanas.
5. Pranayamas (breathing techniques): mukha bhastrika (oral bellows), vyagraha (tiger), surya nadi (sun channel), chandra nadi (moon channel), pranava (AUM chanting breath), nadishuddhi (alternate nostril-I), aloma viloma (alternate nostril-II) and sadanta pranayamas (cooling breath).
6. Relaxation: shavasana with savitri pranayama (2:1 ratio breathing in corpse posture), kayakriya (dynamic body relaxation), marmanasthanam kriya (sequential relaxation) and yoga nidra (yogic sleep).

The following hematological and biochemical parameters were tested by qualified technicians in the Central Laboratory of the hospital before and after the 6 month training period:

1. Total and differential leucocyte (WBC) counts, ESR at ½ and 1hr, erythrocyte (RBC) count, platelet count, hemoglobin (Hb) and hematological indices.
2. Urine pH.
3. Random blood sugar, urea, creatinine, total cholesterol (TC), triacylglycerols (TG), high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) and ratios calculated for TC / HDL, TC / LDL, HDL / LDL, LDL / HDL.
4. Blood electrolytes: sodium, potassium and chloride.
5. Liver function test (LFT): total protein, albumin, globulin, AG ratio, bilurubin (direct), SGOT, SGPT and alkaline phosphatase.

The Ferrans and Powers QoL Index: Generic III version was used to evaluate total QoL Score. [16] The QoL was tested before training, at mid-term (3 months) and after completion of training (6 months). Part I (33 questions) evaluated the subject's satisfaction with different aspects of life and Part II (33 questions) evaluated the importance of those aspects in the subject's life.

1. The health and functioning subscale was evaluated by 13 questions dealing with health, pain, worries etc
2. The social and economic subscale was evaluated by 8 questions dealing with friends, neighborhood, education etc.
3. The psychological and spiritual subscale was evaluated by 7 questions dealing with peace of mind, faith in god, happiness etc.
4. The family subscale was evaluated by 5 questions dealing with family health, family happiness and emotional support from family etc.

Statistical analysis of pre and post intervention data was done using GraphPad InStat version 3.06 for Windows 95 (GraphPad Software, San Diego California USA, www.graphpad.com). All data passed normality testing by Kolmogorov-Smirnov Test and, hence, was analyzed using Students t test for paired data. Repeated measures ANOVA with Tukey-Kramer Multiple Comparisons testing was applied for QoL indices comparing pre, mid and post changes. Percent changes (Δ%) were tested for correlation with attendance in training sessions using Pearson's correlation coefficient. *P* values less than 0.05 were accepted as indicating significant differences between pre and post intervention data.

RESULTS

The results are given in Tables 1-5. Post-intervention statistical analysis revealed a highly significant and beneficial change in all parameters that correlated positively with attendance of the subjects.

There was a highly significant ($p< 0.001$) increase in total WBC, RBC and platelet count, urine pH, TC, HDL, HDL/LDL and chloride levels and a decrease in eosinophils, monocytes, creatinine, LDL, TC/HDL and LDL/HDL. The Neutrophils and AG ratio increased significantly ($p<0.01$) with a concurrent significant increase ($p<0.05$) in basophils, urea, sodium, albumin and bilurubin.

There was a significant improvement in QoL for both mid-training (3 months) and post-training (6 months) comparisons, and this correlated positively ($p< 0.001$ to $p< 0.05$) with the attendance of the subjects. The improvements of QoL were highly significant ($p <0.001$) for pre-mid and pre-post comparisons. It was highly significant ($p< 0.001$) for pre-mid comparisons of health function and psycho-spiritual as well as for pre-post of socio-economic subscales. The improvement was significant ($p< 0.01$) for pre-post of health function, psycho-spiritual and family subscales and for pre-mid comparison of family subscale. It was $p< 0.05$ for pre-mid comparisons in socio-economic subscale.

There were insignificant changes in the other parameters like random blood sugar, potassium, total protein, globulin, SGOT, SGPT, alkaline phosphatase, basophils, monocytes, urea, keratinize, ESR and RBC indices like PCV, MCV, MCH and MCHC.

DISCUSSION

The improvement in the hematological, biochemical and psychological profiles of our subjects may be attributed primarily to yoga training, since these changes were significantly correlated to the frequency of their attendance. Since yoga training was part of the curriculum of our host institute, it was not possible to establish a separate control group. To overcome this limitation, we correlated changes in all parameters with attendance, and a majority of them were significantly positive. This strengthens the direct correlation between the observed changes and yoga training, and, rules out the possibility that these were due to other normal, extraneous or growth-related factors such as nutrition or other forms of physical activity training.

Hematological and biochemical parameters: Hb and blood components (WBC, RBC and platelets) showed significant increases that were positively correlated to the student's frequency of attendance in classes (Table 1). We hypothesize that this may be attributed to either asanas exercising limbs or pranayamas stimulating erythropoiesis, or both. Our hypothesis is based on the fact that a natural response to hypoxia (which can occur during aerobic exercise or changes in altitude) is endogenous erythropoietin (eEpo) synthesis, which stimulates erythropoiesis. [17] An earlier report by Malshe has suggested that benefits of pranayama may be due to daily self-administered brief, intermittent hypoxia causing release of eEpo and Vascular Endothelial Growth Factor (VEGF), thus offering a multitude of benefits in health and a variety of disease conditions. [18] Our hypothesis is also supported by another recent study that reported rapid gene expression changes in peripheral blood lymphocytes upon practice of a comprehensive yoga program. [19] They speculated that the increased expression of Nuclear Factor Erythroid 2 (NFE2) induced by the yoga program may have favorable effects on megakaryocyte maturation and platelet production.

The increase in leukocyte count signifies an improvement in immune function, since these cells play a crucial role in inflammatory processes and in defending against pathogens. In this context, the insignificant rise of ESR in our subjects does not indicate an inflammatory event, but suggests that ESR is playing the role of modulator, as proposed by Carranquea. [20] Carranquea also proposed that this rise is due to the metabolic activity of blood cells and is a consequence of a reduction in oxidation processes due to yoga's anti-stress effect and the release of free radicals at the erythrocyte level. As oxidative activity has a complex duality in terms of benefit, this facet needs to be explored further before definite conclusions can be made.

The decrease in eosinophils is evidence of a reduction in allergic tendencies. This provides a scientific basis for using yoga in allergic conditions where eosinophilia is implicated. Erythrocytes contain hemoglobin, which is involved in the transport of oxygen from the lungs to the tissues and in the buffering of hydrogen ions. Hence, the increase in RBC and Hb is evidence of the health-promoting aspects of yoga even at the cellular level. Such changes are further seen in the significant rise of platelets or thrombocytes, which provide the first hemostatic plug following tissue injury. The biochemical changes in urea and bilurubin levels indicate increased cellular metabolism with a resultant increase in cellular waste products for excretion (Tables 2 and 3). The alkalization of urine (Table 2) is a positive sign, as medical management of urinary tract infections and calculi usually aims to promote alkalization of urine. The post yoga decreases in the number of pus cells and epithelial cells in the urine also indicates a healthier urinary tract and excretory system.

The lipid profile showed a healthy response, with an increase in HDL and decreases in LDL and VLDL (Table 2). All cholesterol ratios also showed positive changes including total cholesterol whose increase (within normal levels) may be attributed to the significant increase in HDL. Normally, the 'safe' TC/HDL ratio is less than 4. It was initially 4.57 ± 0.83 in our subjects, but decreased to a safe level of 3.88 ± 0.87 following the training programme. Similarly, a healthy LDL/HDL ratio is less than 3. Although the initial pre-training level in our subjects was a higher normal value (2.95 ± 0.86), it also fell to a lower normal value (2.25 ± 0.80). The HDL/LDL ratio should normally be more than 0.3, but it is preferable to maintain it above 0.4. This ratio also increased from a lower normal value of 0.37 ± 0.15 to a higher normal value of 0.49 ± 0.19, implying a better prognosis for cardiovascular health. HDL, or good cholesterol, is involved in transporting cholesterol from tissues to the liver. Its increased presence, along with positive changes in all cholesterol ratios, is a sign of the anti-atherogenic effects of yoga. A similar conclusion is also found in the review by Innes [7,8] and in recent reports on healthy volunteers and patients of hypertension and diabetes mellitus. [21, 22, 23].

The TG/HDL ratio decreased significantly from 2.60 ±0.53 to 2.05±0.60, a healthy fall of more than 20%. This finding has positive prognosis as the TG/HDL ratio is an indicator of insulin resistance and a ratio > or =3.5 has been reported to provide a simple means of identifying insulin-resistant, dyslipidemic patients, likely to be at increased risk of cardiovascular disease. [24] Five of our subjects had initial values more than 3.5 and 6 had values more than 3. All of them except for one had reductions in the ratio on post training analysis. This implies a possible breakdown of insulin resistance that is of great health enhancing value in the prevention and management of metabolic conditions such as diabetes and the syndrome X.

The increase in bilurubin in our subjects correlates positively with their attendance. Bilurubin is a major intravascular product of heme catabolism and is a potent antioxidant. A preliminary meta-analytic study demonstrated an unambiguous, inverse relationship between serum bilurubin levels and atherosclerosis, thus indicating its preventive potential in oxidative, stress-mediated diseases. [25] In fact it was recently stated in the editorial of a research topic forum that bilurubin is now recognized as an endogenous cytoprotective compound at low ("physiological") concentrations. [26] Hence, its increase within normal limits in the present study may be interpreted

as a physiological change that indicates the health-promoting effects of yoga.

These health-promoting changes in our subjects may be attributed to improved metabolic activity due to the regular practice of yoga techniques. These techniques have been reported to help yoga practitioners attain ideal body weight and improve their cardiovascular endurance and anaerobic power. [27] Innes and Vincent have suggested that Yoga reduces the cardiovascular risk profile by decreasing activation of the sympatho-adrenal system and hypothalamic-pituitary-adrenal axis and by promoting a feeling of well-being, along with direct enhancement of parasympathetic activity via the vagus nerve. [8]

Quality of life index scores: There was a significant improvement in QoL both at mid training (3 months) and post training (6 months), and this correlated positively with attendance in the yoga sessions (Tables 4 and 5). Improvements appeared in all subscales, including the health function, psycho-spiritual, family and socio-economic categories. Our findings are in line with those of Sharma and Michelson, who reported that a short lifestyle modification and stress management educational programme leads to remarkable improvement in subjective well-being scores. Such interventions can therefore make an appreciable contribution to both primary prevention and management of lifestyle diseases. [13, 28] This is supported by Innes and Vincent, who suggest that yoga-based training programmes provide a source of social support that may be a factor in reducing risk for cardiovascular diseases. [8] According to Madanmohan, 60 hour, comprehensive yoga training programme for medical students at JIPMER showed improvements in psychological well-being, as well as in the subscales of anxiety, depressive mood, positive well-being, self control, general health and vitality.[29] Another recent study on yoga for paramedical students used the Ferrans and Powers QoL index and reported improvements in total QoL and positive changes in all subscales. [16] Although there were 8-12% changes in Δ% scores, these changes did not reach statistical significance due to the smaller sample size and shorter duration of training (3 months). Nevertheless, our present study confirms those findings.

Our findings are similar to those of Malathi and Damodaran, who reported decreased anxiety levels in MBBS students following yoga training. [12] The authors also reported improvements in their subjects´ sense of well-being, their feeling of relaxation, and the quality of their interpersonal relationships, as well as improved concentration, efficiency, self-confidence and, attentiveness, along with lowered irritability levels and a more optimistic outlook on life. They concluded that yoga had reduced basal anxiety levels and attenuated the increase in anxiety scores in stressful states. They postulated that the decrease in anxiety led to better adjustment adaptability towards environmental and internal stressors, which thus enabled participants to better and more calmly perform their routine duties.

Harinath et al reported improvements in both cardiorespiratory performance and psychological profile after three months of yoga. These changes were accompanied by increases in plasma melatonin. [30] A recent review by Sengupta et al suggested that yoga triggers neurohormonal mechanisms that reduce stress and anxiety and acts as a psychophysiological stimulus to increase endogenous secretion of melatonin. This, in turn, improves the sense of well-being. [4] Another large-scale study in the USA reported that mind-body interventions showed significantly greater improvements on perceived stress, sleep quality, and the heart rhythm coherence ratio of HRV. [31] Here, the authors concluded that both mindfulness-based and therapeutic yoga programs may provide effective interventions to target high stress levels, sleep disturbances, and autonomic imbalances in employees. These results are applicable to our study population, a group of nursing students exposed to numerous stressors.

The potential benefits of the various practices in our study may be hypothesized as follows: suryanamaskar improves metabolic function and tones up the musculoskeletal system; trikona, nataraja and veera asanas evoke a sense of stability and balance both physically and mentally; vakra, ardhamatsyendra, paschimottana, pavanamukta, bhujanga and dhanura asanas, by virtue of their twisting and compression-relaxation actions, may be stimulating intra-abdominal organs such as the liver and pancreas, resulting in improvements in hematological, biochemical and lipid profiles; sarvangasana, halasana and viparitakarani may be harmonizing psycho-neuro-endocrine function, as reflected in the biochemical parameters; aloma viloma, suryanadi and chandranadi pranayamas may be normalizing emotional and autonomic balance; pranava and savitri pranayama in shavasana may contribute toward a sense of inner calmness, thus enhancing inherent homeostatic mechanisms; and kaya kriya, marmanasthanam kriya and yoga nidra create a sense of mind-body harmony that facilitates psycho-somatic re-integration.

CONCLUSION

The present study substantiates the psychological and physical benefits of yoga training. All the tested parameters showed desirable changes and most were statistically significant. The major findings are enhanced bone marrow function, reduced allergic tendency, alkalization of urine, metabolic reconditioning with special emphasis on liver function and improved QoL indices. This may be attributed to an improved functioning of the body-mind complex, which is facilitated by breath-body coordination in the yoga practices. On the basis of the present study, we recommend that yoga be made an integral part of medical and paramedical collegiate education.

Table 1. Hematological parameters before and after 6 months of yoga training.

	n	Before	After	Δ%	r	p
Total Count (/ mm^3)	58	6570.69 ±1478.38	7591.38 ±1395.01 ***	18.24 ±22.10	0.2853	**0.03**
Neutrophils (%)	58	54.88 ±7.24	57.71 ±6.08 **	6.21 ±12.80	0.1362	0.3081
Lymphocytes (%)	58	39.71 ± 7.51	39.66 ± 5.54	3.47 ± 24.91	0.1011	0.4502
Eosinophils (%)	57	4.61 ± 2.63	2.26 ± 1.84 ***	-47.53 ± 36.65	0.401	**0.0018**
ESR -1/2hr (mm)	57	6.79 ± 4.33	7.56 ± 2.92	33.05 ± 60.16	0.01026	0.9391
ESR-1hr (mm)	57	15.26 ± 8.75	15.30 ± 6.73	14.70 ± 50.14	0.1089	0.4201
Erythrocytes(RBC) (million/ mm^3)	56	4.33 ± 0.43	4.58 ± 0.52***	5.83 ± 7.64	0.2743	**0.0372**
Hemoglobin (Hb) (gm %)		11.82 ±1.90	12.19 ±1.73***	3.58 ±5.75	0.3048	0.0200
Platelet (lakhs/ mm^3)	57	2.38 ± 0.43	2.72 ± 0.47***	16.41 ± 21.62	0.3514	**0.0068**

Parameters are given as Mean ± SD for 'n' subjects. * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$ by paired t test between pre and post training values. Correlation coefficient (r) and p values are given after applying Pearson linear correlation between pre-post Δ% with the respective attendance in the classes.

Table 2. Biochemical parameters before and after 6 months of yoga training.

	n	Before	After	Δ%	r	p
Urine pH	57	6.18 ± 0.24	6.42 ± 0.35***	3.95 ± 6.34	0.429	**0.0008**
Total cholesterol (TC) (mg/dL)	53	147.96 ± 28.08	154.87 ± 31.27***	4.69 ± 7.98	0.2846	**0.0303**
Triacylglycerols (TG) (mg/dL)	53	83.87 ± 21.02	80.94 ± 22.52	-2.54 ± 15.56	0.2376	**0.0725**
High density lipoprotein (HDL) (mg/dL)	53	32.25 ± 4.01	40.04 ± 5.45***	24.91 ± 16.50	0.5096	**0.0001**
Low density lipoprotein (LDL) (mg/dL)	53	93.68 ± 25.05	88.11 ± 25.56***	-5.60 ± 11.83	0.2652	**0.0443**
Very low density lipoprotein (VLDL) (mg/dL)	53	17.68 ± 4.52	16.55 ± 4.54	-3.44 ± 24.40	0.3396	**0.0091**
TG / HDL	53	2.60 ± 0.53	2.05 ± 0.60***	-20.84 ± 15.83	0.4362	**0.0011**
TC / HDL	53	4.57 ± 0.83	3.88 ± 0.87***	-15.04 ±10.99	0.3801	**0.0033**
TC / LDL	53	1.64 ±0.56	1.84 ±0.68***	12.23 ±14.48	0.4385	**0.0006**
HDL / LDL	53	0.37 ± 0.15	0.49 ± 0.19***	34.85 ± 27.88	0.4876	**0.0001**

Parameters are given as Mean ± SD for 'n' subjects. * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$ by paired t test between pre and post training values. Correlation coefficient (r) and p values are given after applying Pearson linear correlation between pre-post Δ% with the respective attendance in the classes.

Table 3. Liver function parameters before and after 6 months of yoga training.

	n	Before	After	Δ%	r	p
Total Protein (g/dL)	23	7.36 ± 0.44	7.37 ± 0.33	0.38 ± 5.38	0.1906	0.1518
Albumin (g/dL)	25	4.29 ± 0.51	4.52 ± 0.34*	6.51 ± 14.76	0.4312	**0.0007**
Globulin (g/dL)	22	3.08 ± 0.43	2.90 ± 0.38	-5.06 ± 13.92	0.1058	0.4293
AG ratio	22	1.40 ± 0.29	1.60 ± 0.38**	16.73 ± 30.40	0.3868	**0.0027**
Bilurubin total (mg/dL)	24	0.82 ± 0.42	0.91 ± 0.43*	22.78 ± 40.40	0.3371	**0.0097**

Parameters are given as Mean ± SD for 'n' subjects. * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$ by paired t test between pre and post training values. Correlation coefficient (r) and p values are given after applying Pearson linear correlation between pre-post Δ% with the respective attendance in the classes.

Table 4: Ferrans and Powers Quality of Life Index scores: pre, mid and post six months of yoga training.

	pre	mid	post	p value
Overall QoL	18.37 ± 3.07	20.35 ± 2.49 ***	20.13 ± 2.30 ¥¥¥	**< 0.0001**
Health and function	18.54 ± 3.60	21.17 ± 2.96 ***	20.46 ± 3.14 ¥¥	**<0.0001**
Socio-economic	19.29 ± 3.71	20.65 ± 3.47 *	21.54 ± 2.90 ¥¥¥	**0.0001**
Psycho-spiritual	19.26 ± 4.70	21.93 ± 3.91 ***	21.51 ± 3.12 ¥¥	**<0.0001**
Family subscale	19.29 ± 5.87	21.66 ± 4.34 **	21.56 ± 4.80 ¥¥	**0.0024**

Values given as mean ± SD for 60 subjects. P values are given for intergroup compassions done by repeated measures of ANOVA with Tukey-Kramer Multiple Comparisons Test.
* = $p < 0.05$, ** = $p < 0.01$ and *** = $p < 0.001$ between pre and mid values.
¥¥ = $p < 0.01$ and ¥¥¥ = $p < 0.001$ between pre and post values.

Table 5: Correlation of various parameters of Ferrans and Powers QoL Index, with attendance of the subjects during pre-post, pre-mid and mid-post periods of the six months yoga training.

Parameter	Comparison	Attendance	Δ %	r value	p value
Overall QoL	pre-post	19.48 ± 8.27	12.11±19.87	0.4868	**< 0.0001**
	pre-mid	11.90 ± 5.59	13.53 ± 22.18	0.5273	**< 0.0001**
	mid-post	7.58 ± 5.03	0.10±15.29	0.5617	**< 0.0001**
Health and function	pre-post	19.48 ± 8.27	14.74±30.02	0.3936	**0.0019**
	pre-mid	11.90 ± 5.59	18.58 ± 29.42	0.4019	**0.0015**
	mid-post	7.58 ± 5.03	-1.69±20.02	0.5668	**< 0.0001**
Socio-economic	pre-post	19.48 ± 8.27	15.40±25.46	0.3778	**0.0029**
	pre-mid	11.90 ± 5.59	10.39 ± 25.97	0.5143	**< 0.0001**
	mid-post	7.58 ± 5.03	6.65±20.54	0.3312	**0.0098**
Psycho-spiritual	pre-post	19.48 ± 8.27	17.99±32.92	0.2582	**0.0464**
	pre-mid	11.90 ± 5.59	20.12 ± 36.06	0.3992	**0.0016**
	mid-post	7.58 ± 5.03	1.62±26.50	0.3935	**0.0019**
Family subscale	pre-post	19.48 ± 8.27	27.96±71.22	0.3149	**0.0143**
	pre-mid	11.90 ± 5.59	32.07 ± 83.28	0.3998	**0.0016**
	mid-post	7.58 ± 5.03	1.35±21.89	0.3412	**0.0076**

Values given as mean ± SD for 60 subjects. Correlation coefficient (r) and p values are given after applying Pearson linear correlation between pre-post, pre-mid and mid-post Δ% with the respective attendance in the classes.

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