



THE EFFECT OF AGNISARA KRIYA ON GASTRIC MOTILITY IN STUDENTS WITH OBESITY - A RANDOMIZED CONTROLLED OPEN TRIAL

Yoga therapy

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ABSTRACT

Background: Obesity is a health disorder and increasing all over the world. It is also a cause for many non-communicable diseases. Yoga is one such intervention that helps to reduce weight. In the present study, the efficacy of Agnisara kriya is studied based on objective parameters of obesity.

Objective: To understand the influence of Agnisara Kriya on EGG in obese students.

Methods: A total of 60 obese individuals are randomly allocated equally into groups 1 and 2 consisting of 30 subjects each using a computerized randomization procedure as a case group and control group respectively. Baseline data were collected by the investigator and the intervention group underwent Agnisara Kriya for 1 month. The control group underwent normal routine activities. Post-intervention data were collected at the end of the 31st day. The data collected were tabulated and analyzed using the Paired Sample t-test and Wilcoxon Signed Rank Test.

Results: Results showed after 1 month of training of Agnisara kriya, group 1 presented significantly increases gastric motility ($p < 0.05$) in comparison to group 2 where there were no significant changes.

Conclusion: Results indicate a significant increase in gastric motility in obese subjects after 1 month of practice of Agnisara kriya.

KEYWORDS

Yoga; Obesity; Agnisara kriya; Gastric Motility; Electrogastrography(EGG).

INTRODUCTION

The Asia Pacific region has the largest number of overweight and obese people equivalent to one billion. In these regions, two out of every five adults are either overweight or obese and because of this the various aspects of quality of life are impaired in persons with obesity; these include low self-esteem, impaired psychosocial functions, disability, reduced physical activity, and sexual dysfunction. (1). Etymologically, yoga means to "add," "join," "unite" or "attach" (Sanskrit, yoga) where the body (anga), mind (Chitta), emotions, and the soul (Atma or atman) becomes one. (2) Yoga is an ancient philosophy designed to bring balance and health working on all aspects of the person; the physical, mental, emotional, psychic, vital, and spiritual dimensions. (3) The hatha yoga pradiipika, renowned yogic texts by yogi Swatmarama, emphasizes practicing shat karma which includes Dhauthi (4) which cleanses the entire alimentary canal from mouth to the anus. (5) Agnisara kriya is one among the dhauthi techniques which activate digestive fire, the abdominal organs get massaged by the practice of Agnisara kriya (6) Agnisara Kriya is a method of flapping or contracting the abdominal muscles in and out and promotes gastrointestinal motility. (7) Obesity is an important health problem leading to esophageal dysmotility. (8) Electrogastrography, a non-invasive method similar to electrocardiography which is applied to detect gastric slow waves using abdominal surface electrodes the disturbance in gastric slow-wave rhythm is noted by the changes in the dominant frequency of the gastric slow wave. Adult patients with morbid obesity have revealed a significant increase in the percentage of bradygastria (decreased gastric slow-wave than the normal) (9) The surface recording obtained using electrography is called the electrogastrogram (10) The frequency of normal gastric slow waves is species-dependent, being approximately 3 cycles per minute (CPM) in humans it is shown in Figure (1) and 5 CPM in dogs. (11, 12, 13, 14, 15)

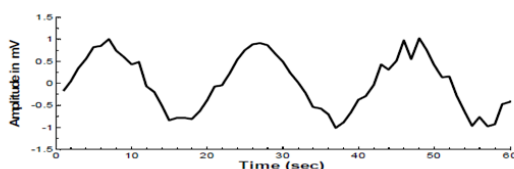


Figure. 1 Normal EGG Signals. (16)

Leptin receptors are found in afferent and efferent endings of the vagus nerve, modulating gastrointestinal motility and thus concluded that leptin decreases gastric and intestinal motility. (17) Gastric motility (contractile activity) is under the control of the Myoelectrical activity of the stomach and the slow-wave is the component of it which is omnipresent that determines the frequency, propagation velocity, and propagation direction of gastric contractions. It originates in the proximal stomach and propagates distally towards the pylorus. (9) Yoga is an ancient discipline of body, mind, and spirit that has been westernized and practiced for its health benefits as a complement to more conventional medical therapy. (18). Agni plays the most important role in the digestion and metabolism of all types of food products. The dietary styles and quality of the diet are also vital factors in the maintenance of the proper functioning of the digestive system. Any wrong habit can lead to disturbances in these mechanisms. Improper digestion leads to the accumulation of toxins in the body, ultimately resulting in obesity. (19) Not much research is done on the effect of Agnisara kriya on obesity and this will be the first study conducted to understand how Agnisara kriya helps in improves gastric motility. Hence this study is taken to see the effect of Agnisara Kriya on Gastrointestinal Motility in obese individuals.

METHODOLOGY

Description Of Subjects: The study populations were recruited from the various colleges in and around Ujire, Beltangady Taluk, Dakshina Kannada district, Karnataka. Sixty subjects who were not aware of Agnisara Kriya previously were recruited for the study based on inclusion and exclusion criteria.

Phase 1: The participants were assessed for anthropometry (i.e. weight and height using standard methods) to determine their BMI ≥ 25 kg/m². Using a standard balance beam scale to record the participant's weight and height without footwear and the BMI range were considered for the second phase.

Phase 2: In this phase, the participants were screened for any other obese associated co-morbidities like Diabetes Mellitus, Hypertension, Epilepsy, Bronchial Asthma, Cardiovascular diseases, at this stage, all the participants gave their signed informed consent to be included in the trial, all of them provided their socio-demographic details and the

form included their name, age, gender, occupation, years of education, and other details. Subjects were given enough time to go through the study details mentioned in the information sheet. They were allowed to ask any questions.

Participants

A total of 60 participants were recruited for the study and the inclusion criteria were as follows: (i) An Individual of age group 18 to 25 years old, (ii) body mass index (BMI) ≥ 25 kg/m², (iii) both the genders, (iv) voluntarily willing to participate in this study. Exclusion criteria were as follows: (i) the subject with any other medical condition, (iii) Subjects having habits of drinking alcohol and smoking. (iv) subjects taking any medication, (v) those exposed to any infection during the study period like fever and infection. None of the participants had to be excluded for these reasons. The study had the approval of the institution's ethical committee (EC-214). Selected 60 subjects were randomly allocated into intervention (n=30) and control groups (n=30).

Study Design

A randomized waitlist control open trial. The waitlist control group was taught the practice of Agnisara Kriya after the completion of the study.

Randomization

A total of 60 obese individuals who met the inclusive criteria was randomly allocated equally into the Agnisara Kriya group and control group using a computerized randomization procedure with a 1:1 ratio to get a sample size of (n=30).

The Setting For Assessment & Intervention:

- **Group I: Agnisara kriya**

Subjects were given the practice of Agnisara Kriya for 30 -50 rounds for 2 times in a day. Under the supervision throughout.

- **Group II: Control group**

Subjects underwent normal routine activities.

Assessments:

The entire subjects in the group were assessed before the intervention to take pre-data and post-data was taken after 30 days of intervention.

Electrogastrography: Surface "EGG" - to study gastric myoelectric activity. It is done on day 1 and after 30 days of intervention for both the groups. EGG recording for 30 min on fasting state of 6-8 hours followed by another 30 min, for both intervention and control group on 1st day and after the 30 days of intervention. (20)

Procedure For Recording The Electrogastrography:

Skin Preparation: First, the abdominal skin where the electrodes are to be positioned was thoroughly cleaned using some sandy skin-preparation jelly, then a thin layer of electrode jelly is applied for 1 minute till it penetrates the skin. Excess jelly was wiped out before placing the electrodes. (21, 22)

Electrode Placement: Regular ECG electrodes were used for EGG recordings. One electrode was placed at the midpoint on a line connecting the xiphoid and umbilicus, and the other electrode 5 cm away (up and 45 degrees) to the patient's left. The ground electrode is placed on the left costal margin horizontal to the first active electrode. (20, 23)

Subject Position: the subject is in a comfortable supine position, so that body movement can be completely avoided or reduced to the minimal. The subject was asked not to talk, move, read, or to make phone calls during the procedure, and also the timing of unavoidable body movement or motion artifacts and the recording periods with motion artifacts must be removed before analysis. (24, 22)

Duration Of Recording: According to previous research 30 minutes of accurate measurement of gastric slow waves was measured. (25)

Intervention

Group I: Agnisara Kriya [4]

Procedure: Sit in Bhadrasana with the big toes touching, inhale deeply, exhale, emptying the lungs as much as possible. Lean forward

slightly, straightening the elbows. Push down on the knees with the hands and perform Jalandhara bandha. Contract and expand the abdominal muscles rapidly for as long as it is possible to hold the breath outside comfortably. Do not strain. Release Jalandhara bandha. When the head is upright, take a slow, deep breath in. This is one round. Relax until the breathing normalizes.

Duration: Subjects were advised to practice the Agnisara Kriya for 30 - 50 rounds [4] and were monitored. [3]

Group 2: Subjects underwent normal routine activities.

Data Extraction & Statistical Analysis

Data Extraction: The data was collected using an EGG. The assessments were collected as baseline data and post-intervention data (after 30 days). The data later were further scored using their respective scoring keys and then arranged in Microsoft Excel sheets for statistical analysis.

Statistical Analysis: Data were analyzed using R software version 3.5.2. The statistical tests used are mentioned below. Normality was assumed and the Shapiro Wilk test whenever the normality assumption is satisfied with the parametric tests like two-sample t-tests, paired sample t-tests are used and non-parametric tests were employed whenever normal assumption isn't valid, the non-parametric tests like the Wilcoxon Signed Rank test, Mann Whitney U test are used. According to that within the group comparison of EGG was done using the Wilcoxon Signed-Rank test.

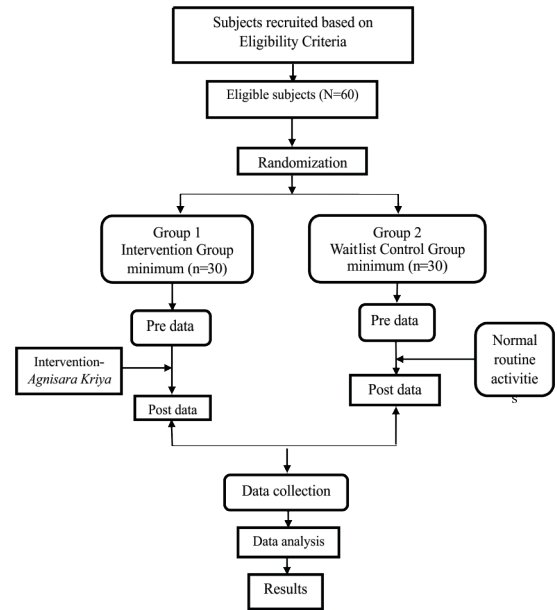


Figure 2 : Trial Profile

RESULTS

From table 1, it is safe to conclude that the mean of EGG tends to increase (p value~0.000<0.05) significantly, in the intervention group where the individuals were under the influence of Agnisara Kriya when compared to the individuals in the control group, with no intervention (p-value of EGG = 0.184>0.05). The graphical representation of the EGG is represented in Figure 3. The choice is obvious because effective treatment must cause an increase in the measurement of the variables. The 95% confidence intervals are constructed because the level of significance fixed for the study is 0.05.

Descriptive Statistics

Table 1: Baseline assessment and post-assessment of Agnisara Kriya (n=30) and control group (n=30) on the EGG

GROUPS	EGG		p-value	CI
	Mean ± SD			
	Pre	Post		
Case	2.1118 ± 0.5833	2.180263 ± 0.4289	0.0000δ	[1.18951 1.502405]

Control	2.240863 ± 0.572461	2.180263 ± 0.577354	0.184	[-0.11615 0.02025]
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Note: Values are in Mean ± SD; P- values represented in bold is significant (<0.05);

δ = Wilcoxon Signed-Rank test; SD = Standard deviation; CI= Confidence interval;

EGG=Electrogastrography

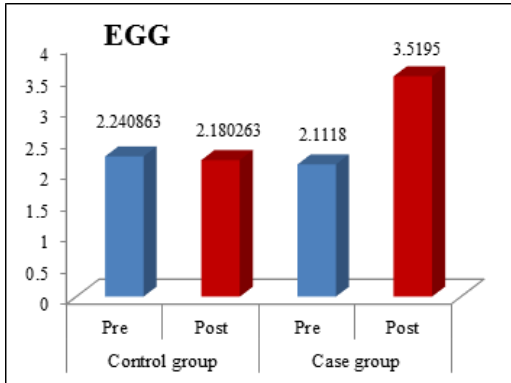


Figure 3: Pre and post comparison of mean values of an EGG in Agnisara Kriya group and control group

Percentage Change: The positive percentage indicates the increase in the variable. Therefore we can conclude that after the intervention there was an increase in Gastric Motility showed in table 2

Table 2: Percentage Change

EGG	Control group	-2.70432
	Case group	66.65877

$$\% \text{ change} = \frac{(\text{Post}-\text{Pre})}{\text{pre}} \times 100$$

Comparative Study Using Gain Scores: The average gain scores of EGG loss scores of the intervention group are found to be higher when they are respectively compared with the average gain scores of EGG of the control group i.e. the intervention has increased the EGG to a larger extent when compared with non-intervention group as shown in table 3.

Table 3: Results Of A Comparative Study Using A Gain Score

	p-value	
	Two-tailed	One-tailed
EGG	0	0.0000*

* = Statistical test used: independent sample t-test

DISCUSSION

The world is looking towards drugless therapy like Yoga and Naturopathy. Both are rapidly growing the best alternative treatments. Sushruta has mentioned about the drugless therapy and quotes that diseases may be cured by following a proper diet and lifestyle without any medicine. But in the absence of a proper diet and lifestyle, even after giving hundreds of medicines, the disease can't be cured. (19) With increased awareness and interest in health and yogic techniques are gaining importance and becoming increasingly acceptable to the scientific society. (26) The present study was designed to determine the impact of a 30 days practice of Agnisara kriya on gastric motility in obese individuals. The major finding of the present study was EGG which tends to increase after the intervention when compared with baseline values in individuals with obesity. Yoga intervention which included Agnisara (rigorous movement of the abdominal muscles), when practiced at home, showed positive changes over time in general autonomic functions and gastric motility (EGG amplitude. The Yoga group showed significant improvements in autonomic symptom score, bowel symptom score, state anxiety, physical flexibility, and had significant improvements in resting EGG amplitude). (27) A case report done on a 62-year-old male patient diagnosed with grade D Esophagitis who was under high dose of Proton Pump Inhibitors started practicing yoga which included Agnisara Kriya showed to

promote improved digestion and gastrointestinal motility. (7) Another randomized controlled trial (RCT) evaluated the comparative efficacy of 12-week yoga-based lifestyle intervention (YBLI) and dietary intervention (DI) alone on leptin in Indian adults with metabolic syndrome (Met S) in which the YBLI group showed a significant decrease in, leptin (28) thus improving the gastric motility. The practice of fast breathing with the flapping causes shallow respiration which decreases the tidal volume and increases breathing thus Oxygen consumption is also increased due to increased breathing work. (19) The Vagus nerve is modulated by respiration. It is suppressed during inhalation and facilitated during exhalation. (29) Therefore, this particular intervention which has continuous bouts of exhalation causes stimulation of the vagus nerve, and these Vagal reflex control circuits maintain gastric motility and improve it. (30) The effects of accelerated or voluntary hyperventilation breathing techniques accelerated breathing like agnisara kriya causes autonomic reactivity. (19) Therefore the practice of Agnisara Kriya appears to shift the overall basal autonomic balance to the parasympathetic direction. (31) The possible reasons for the improvement in gastric motility in the present study Agnisara Kriya involve exhalation followed by forceful contraction of abdominal muscles, it is a form of the abdomen-respiratory-autonomic exercise stimulating respiratory, abdominal, and gastrointestinal receptors also, afferent centers in the brain stem and cortex and efferents and effectors leading to synchronous stimulation of the Autonomic nervous system, hypothalamus, Pineal gland, and other associated brain structures. (32) Based on previous research Yogic intervention consisting of Agnisara kriya had favorable changes in general autonomic functions and thus yogic intervention resulted in enhanced parasympathetic reactivity and yogic intervention had shown better therapeutic results than did the conventional treatment. (33) However, as far as we are aware, no study to date has investigated the effect of Agnisara Kriya alone on the EGG, on obese individuals. Thus this study closes an important gap in assessing the effectiveness of Agnisara kriya on the EGG in obese individuals.

LIMITATIONS

- The present study has a very small sample size.
- obesity is a chronic condition and thus long-term treatment and follow-up will be required.
- Blinding was not possible to both the investigator as well as the subjects.
- A future study with a larger number of participants is necessary.

STRENGTH OF THE STUDY

- To our best knowledge, this is the first study done to evaluate the effect of Agnisara Kriya on Electrogastrography in obese individuals.

DIRECTIONS FOR FUTURE RESEARCH

- More specific objective assessment tools can be employed with a larger sample size.
- The study can be done on all the age groups to assess the efficacy of the intervention.

CONCLUSION

The present study concludes that Agnisara kriya can be used as an alternative therapy to improve gastric motility in obese individuals. Further, it can also be beneficial for reducing the risk factors associated with obesity like cardiovascular diseases, atherosclerosis, diabetes, hypertension, and depression. The practice of Agnisara Kriya can be employed in hospitals and health care facilities.

SUMMARY

The present study compared the effect of Agnisara Kriya on electrogastrography in obese individuals. A total of 60 subjects aged 18 to 25 years both male and female were randomized into the Agnisara Kriya group (n=30) and the control group (n=30) and intervention was given daily 40 minutes for 30 days. Assessments were done at the baseline and post-intervention after 30 days. Results of the present study shows, following Agnisara kriya there was a significant improvement in electrogastrography. Hence this study concludes the practice of Agnisara Kriya is considered to provide beneficial effects by improving the gastric motility thus reducing the complications related to obesity. This gives more insight into how this can help to prevent co-morbid conditions like hypertension, diabetes, hypocholesterolemia, cardiovascular diseases, atherosclerosis, and other mood

disorders associated with obesity.

REFERENCES

- Telles, S., Sharma, S. K., Singh, A., Kala, N., Upadhyay, V., Arya, J., & Balkrishna, A. (2019). Quality of Life in Yoga Experienced and Yoga Naïve Asian Indian Adults with Obesity. *Journal of Obesity*, 2019.
- Ramos-Jiménez, A., Wall-Medrano, A., Corona-Hernández, R. I., & Hernández-Torres, R. P. (2015). Yoga, bioenergetics and eating behaviors: A conceptual review. *International Journal of Yoga*, 8(2), 89.
- Sengupta, P. (2012). Health impacts of yoga and pranayama: A state-of-the-art review. *International journal of preventive medicine*, 3(7), 444.
- Swami Muktibodhananda (2012) *Hatha Yoga Pradipika*, Yoga Publications Trust, Ganga Darshan, Munger, Bihar, India.
- Patra, S. K. (2017). Physiological effect of kriyas: Cleansing techniques. *International Journal of Yoga-Philosophy, Psychology and Parapsychology*, 5(1), 3.
- Satyananda Saraswati, Bihar School of Yoga, Yoga Publications Trust (Munger I. A systematic course in the ancient tantric techniques of yoga and kriya. 2013.
- Kaswala, D., Shah, S., Mishra, A., Patel, H., Patel, N., Sangwan, P., ... & Brelvi, Z. (2013). Can yoga be used to treat gastroesophageal reflux disease?. *International journal of yoga*, 6(2), 131.
- Côté-Daigneault, J., Leclerc, P., Joubert, J., & Bouin, M. (2014). High prevalence of esophageal dysmotility in asymptomatic obese patients. *Canadian Journal of Gastroenterology and Hepatology*, 28.
- Xing, J., & Chen, J. D. (2004). Alterations of gastrointestinal motility in obesity. *Obesity research*, 12(11), 1723-1732.
- Yin, J., & Chen, J. D. (2013). Electrogastrography: methodology, validation and applications. *Journal of neurogastroenterology and applications*, 19(1), 5.
- Chen, J. D. Z., & McCallum, R. W. (1993). Clinical applications of electrogastrography. *American Journal of Gastroenterology*, 88(9).
- Lin, X., & Chen, J. Z. (2001). Abnormal gastric slow waves in patients with functional dyspepsia assessed by multichannel electrogastrography. *American Journal of Physiology-Gastrointestinal and Liver Physiology*, 280(6), G1370-G1375.
- Yin, J., Levanon, D., & Chen, J. D. Z. (2004). Inhibitory effects of stress on postprandial gastric myoelectrical activity and vagal tone in healthy subjects. *Neurogastroenterology & Motility*, 16(6), 737-744.
- Qian, L. W., Pasricha, P. J., & Chen, J. D. Z. (2003). Origins and patterns of spontaneous and drug-induced canine gastric myoelectrical dysrhythmia. *Digestive diseases and sciences*, 48(3), 508-515.
- Ouyang, H., Xing, J., & Chen, J. D. Z. (2005). Tachygastria induced by gastric electrical stimulation is mediated via α - and β -adrenergic pathway and inhibits antral motility in dogs. *Neurogastroenterology & Motility*, 17(6), 846-853.
- Chen, J. D. Z., Zou, X., Lin, X., Ouyang, S., & Liang, J. (1999). Detection of gastric slow wave propagation from the cutaneous electrogastrogram. *American Journal of Physiology-Gastrointestinal and Liver Physiology*, 277(2), G424-G430.
- Yarandi, S. S., Hebbbar, G., Sauer, C. G., Cole, C. R., & Ziegler, T. R. (2011). Diverse roles of leptin in the gastrointestinal tract: modulation of motility, absorption, growth, and inflammation. *Nutrition*, 27(3), 269-275.
- US RAY, S. M., PURKAYASTHA, S., ASNANI, V., TOMER, O., PRASHAD, R., THAKUR, L., & Selvamurthy, W. (2001). Effect of yogic exercises on physical and mental health of young fellowship course trainees. *Indian J Physiol Pharmacol*, 45(1), 37-53.
- Joshi, S., Deole, Y. S., Vyas, G. H., & Dash, S. C. (2009). Management of Overweight and Obesity through specific Yogic procedures. *AYU (An international quarterly journal of research in Ayurveda)*, 30(4), 425.
- Camilleri, M., Hasler, W. L., Parkman, H. P., Quigley, E. M., & Soffer, E. (1998). Measurement of gastrointestinal motility in the GI laboratory. *Gastroenterology*, 115(3), 747-762.
- Simonian, H. P., Panganamamula, K., Parkman, H. P., Xu, X., Chen, J. Z., Lindberg, G., ... & Hansen, P. (2004). Multichannel electrogastrography (EGG) in normal subjects: a multicenter study. *Digestive diseases and sciences*, 49(4), 594-601.
- Simonian, H. P., Panganamamula, K., Chen, J. Z., Fisher, R. S., & Parkman, H. P. (2004). Multichannel electrogastrography (EGG) in symptomatic patients: a single center study. *American Journal of Gastroenterology*, 99(3), 478-485.
- Chen, J. D. Z., Lin, Z., Pan, J., & McCallum, R. W. (1996). Abnormal gastric myoelectrical activity and delayed gastric emptying in patients with symptoms suggestive of gastroparesis. *Digestive diseases and sciences*, 41(8), 1538-1545.
- Verhagen, M. A., Van Schelven, L. J., Samsom, M., & Smout, A. J. (1999). Pitfalls in the analysis of electrogastrographic recordings. *Gastroenterology*, 117(2), 453-460.
- Levanon, D., Zhang, M., & Chen, J. D. Z. (1998). Efficiency and efficacy of the electrogastrogram. *Digestive diseases and sciences*, 43(5), 1023-1030.
- Tiwari, S. P. Roy D. A Study on the effect of Shatkarma on Body Weight in the Patients of Diabetes Mellitus. *An international Peer-Reviewed Journal: Volume-2 Issue-3(2013)*.
- Rshikesan, P. B., & Pailoor Subramanya, R. N. (2016). Yoga practice for reducing the male obesity and weight related psychological difficulties-a randomized controlled trial. *Journal of clinical and diagnostic research: JCDR*, 10(11), OC22.
- Patterson, M., Rintala, R., Lloyd, D., Abernethy, L., Houghton, D., & Williams, J. (2001). Validation of electrode placement in neonatal electrogastrography. *Digestive diseases and sciences*, 46(10), 2245-2249.
- Gerritsen, R. J., & Band, G. P. (2018). Breath of life: The respiratory vagal stimulation model of contemplative activity. *Frontiers in human neuroscience*, 12, 397.
- Chen, C. H., Stephens Jr, R. L., & Rogers, R. C. (1997). PYY and NPY: control of gastric motility via action on Y1 and Y2 receptors in the DVC. *Neurogastroenterology & Motility*, 9(2), 109-116.
- Kennedy, J. E. (1990). Yoga breathing techniques: implications for stress management, health, and psychophysiological research. Published on the internet at <http://jeksites.org/yoga.resp.htm>.
- Kekan, D. R. (2013). Effect of kapalbhati pranayama on body mass index and abdominal skinfold thickness. *Indian Medical Gazette, Alternative Medicine*, 431, 421-425.
- Taneja, I., Deepak, K. K., Poojary, G., Acharya, I. N., Pandey, R. M., & Sharma, M. P. (2004). Yogic versus conventional treatment in diarrhea-predominant irritable bowel syndrome: a randomized control study. *Applied psychophysiology and biofeedback*, 29(1), 19-33.