

Yoga Based Lifestyle for Prevention of Medical Emergencies

Bhargav H, Nagarathna R, Nagendra HR*

Swami Vivekananda Yoga Anusnadhana Samsthana (S-VYASA) Yoga University, Bangalore, India

ABSTRACT: *Most common medical emergencies may be categorized into following major categories: 1) Acute complications of chronic non-communicable diseases (NCDs), 2) Injuries due to accidents and assaults, 3) Complications of infections, 4) Pregnancy related complications and 5) those due to poisoning and drug over-dosage. Lifestyle factors such as diet, physical activity, sleep, substance abuse and psychological stress, are important direct or indirect contributors towards these emergencies. We performed an integrative literature review consulting databases of 'pubmed' and 'google scholar' from the year 2000 to 2015 using following key words: 'medical emergency', 'lifestyle', 'yoga', 'meditation', 'prevention' and 'complications'. Randomized controlled trials, controlled trials, uncontrolled trials, systematic reviews and meta-analyses were included in this integrative literature review. We also classified these emergencies into four categories depending on their prevalence and usefulness of yoga based lifestyle: 1) Yoga based lifestyle to manage common NCDs and Prevent Complications; 2) Yoga based lifestyle to reduce Stress, Aggression and Substance Abuse in Youth; 3) Yoga Based lifestyle for Prevention and Management of Infections; 4) Yoga based lifestyle for preventing pregnancy related complications. We found that Yoga based lifestyle (YBL) has been effectively used for prevention and management of various chronic medical illnesses. Yoga techniques that include physical postures, regulated breathing, meditation and relaxation help manage the life style better have the potential of bringing down the prevalence of medical emergencies through various direct and indirect mechanisms.*

Keywords: *Medical emergency, lifestyle, yoga, meditation, prevention, complication*

INTRODUCTION

A medical emergency is an acute morbidity that poses an immediate risk to life as well as long-term health. WHO predicts noticeable rise in emergency morbidity load in next few decades (McQueen, 2009). A significant burden of diseases in developing countries is caused by time-sensitive illnesses and injuries, such as severe infections, hypoxia caused by respiratory infections, dehydration caused by diarrhea, intentional and unintentional injuries, postpartum bleeding, and acute myocardial infarction (Razzak & Kellermann, 2002). The conditions with which a patient will approach the emergency department vary from the rural to urban setup. (Gupta, 2009) Most common medical emergencies may be categorized into following major categories: 1) Acute complications of chronic non-communicable diseases (NCDs), 2) Injuries due to accidents and assaults, 3) Complications of infections, 4) Pregnancy related complications and 5) those due to poisoning and drug over-dosage (Razzak & Kellermann, 2002; Garg, 2013; Saddichha, Saxena, Pandey & Methuku, 2009).

Yoga Based Lifestyle

Yoga based lifestyle (YBL) involves life style modification based on the concepts of right living from Indian yoga psychology. Accordingly, the four components of life style namely diet, lack of exercise, bad habits (alcohol, smoking, uncontrolled desires) and emotional stress are all traceable to the mind (Nagarathna & Nagendra, 2002). YBL includes simple and safe practices at physical, mental, emotional, intellectual levels to reach a state of mastery over the modifications of the mind through effortless blissful inner awareness during all practices (Nagarathna & Nagendra, 2002; Nagendra & Nagarathna, 2002).

Role of Psychological Stress in Various Medical

Emergencies

Emergencies due to complications of NCDs

Among those due to complications of NCDs, most common emergencies are hypertension, acute asthma attack, convulsions, hypoglycemia, myocardial infarction, shock, stroke and psychiatric emergencies (Garg, 2013; Saddichha, Saxena, Pandey & Methuku, 2009). In a survey in the emergency department of a tertiary care teaching hospital in India, Garg et al found that in 2013, nearly half of emergency subjects were males and a great majority was in the age group of 15–40 years. They also found that diseases related to the cardiovascular system topped the list, of which hypertension was noted in most cases (Garg, 2013). Majority of these NCDs are lifestyle related and their progression towards acute complications are often triggered by lifestyle changes (Yusuf, 2004; Mittleman, 1995). Psychological stress has been shown to contribute significantly towards lifestyle disorders (Mittleman, 1995).

Emergencies due to accidents, assaults and violence

For those emergencies which involve accidents and assaults, it was observed that males, in the 19-30 year age group, were more often involved in risk and violence. Violence, especially interpersonal violence, has been noted to be maximum in the age group of 15-29 years and among males in earlier studies also (Baruah & Barua, 2007). The age between 15-29 years is the period when young people face the realities of living and strive to make their own existence. Such experiences result in increased risk of being involved in accidents or assaults. An increased prevalence of assaults in this age group is also highly concerning since this can result in a serious

*Correspondence regarding this article should be directed to: hnn@vyasa.org

loss of bread-winners to the family. Programs designed to educate on means of coping with stress may reduce some occurrence of interpersonal violence. It would also be necessary to curb substance use, since a high level of alcohol consumption of has been noted in this population and which can prove disastrous (Medhi, Hazarika & Mahanta, 2006).

Emergencies due to complications of infections

Among infections, viral infections are most common cause for medical emergencies. Especially in developing countries, one of the common causes of pain abdomen is rota virus diarrhea, seen mainly in children (Phukan, Patgiri & Mahanta, 2003). Cholera outbreaks also occur commonly in developing countries, these viruses are sometimes resistant to commonly used antimicrobials (Phukan, Borah, Biswas & Mahanta, 2004). Other prevalent infections are respiratory infections which may be viral or bacterial in origin. Apart from viral infections, infections due to bacteria's are frequently known cause for medical emergencies (Razzak & Kellermann, 2002). Immunity and lifestyle factors are closely interlinked. Inhibiting or holding back one's thoughts, feelings, and behaviors is associated with long-term stress and disease. A meta-analysis of 300 studies concludes that chronic stressors reduce both cell mediated and humoral immunity of the host (Segerstrom & Miller, 2004). There is also evidence that chronic stress impairs the immune system's response to anti-inflammatory signals. The capacity of a synthetic glucocorticoid hormone to suppress in vitro production of the pro-inflammatory cytokine interleukin-6 was found diminished among parents of cancer patients (Miller, Cohen & Ritchey, 2002). Thus, an intervention which reduces psychological stress may have important role to play in strengthening the immune system there by reducing spread of infections and preventing complications.

Pregnancy related emergencies

Pregnancy remains as one of the top causes of medical emergencies especially in developing countries (Garg, 2013; Saddichha, Saxena, Pandey & Methuku, 2009). Previous studies have noted a similar trend with most pregnancies occurring in the age group of 20-30 years (Gogoi & Ahmed, 2007). Therefore, targeting ante-natal care especially in the age group of 20-30 years (Saddichha, Saxena, Pandey & Methuku, 2009) could reduce morbidity and mortality. Pregnancy is a unique state of physiological stress, which necessitates physical, mental and social adaptation.

Stressors during pregnancy vary from life events (e.g. divorce, serious illness or death of a relative or friend) to daily trials and tribulations (e.g. domestic affairs, financial or social problems). During exposure to a stressor, the whole system of stress regulation, ie: the hypothalamus-pituitary-adrenal cortex system (HPA axis) and the sympathetic nervous system- adrenal medulla system, is activated (Mulder et al., 2002). In addition, normal pregnancy is associated with - 4 - physical alterations, hormonal changes (often associated with rapid changes in mood), anxiety regarding labor and fetal outcome, all of which potentially worsen the stress response. These factors contribute significantly towards occurrence of emergency situations during pregnancy (Sulochana & Samsthana, 2005).

Poisoning, substance abuse and drug over-dosage

Poisoning and over-dosage of drugs are another frequent cause for medical emergencies. Acute pesticide poisoning is a major public health problem. According to World Health Organization (WHO 1990) estimates, around 3 million poisoning cases with 220 000 deaths occur annually. About 99% of these deaths occur in developing countries. In several agricultural districts, it precedes all other causes of death in government hospitals. Organophosphorus (OP) compounds cause most self-poisoning deaths in southern and central India (Batra, Keoliya & Jadhav, 2003). Most of the acute

poisoning cases are intentional (suicide) and occur among young adults, mainly males (Van Der Hoek, Konraden, Athukorala & Wanigadewa, 1998). Poisoning due to occupational exposure is also common, but less well documented. Several psychopathologic risk factors are identified for adolescent suicide and suicidal behavior, namely, affective, disruptive, substance abuse, psychotic, and personality disorders. The role of family environmental risk factors in suicide and suicidal behavior is also important (Brent, 1995). All these factors can be ultimately traced down to inability of the youth and family to handle emotional distress (Brent, 1995). Thus, we decided to perform a literature survey to understand preventive value of yoga based lifestyle in various common medical emergencies.

METHODOLOGY

We performed a integrative literature review consulting databases of 'pubmed' and 'google scholar' from the year 2000 to 2015 using following key words: 'medical emergency', 'lifestyle', 'yoga', 'meditation', 'prevention' and 'complications'. Randomized controlled trials, controlled trials, uncontrolled trials, systematic reviews and metaanalyses were included in this integrative literature review. We also classified these emergencies into four categories depending on their prevalence and usefulness of yoga based lifestyle: 1) Yoga based lifestyle to manage common NCDs and Prevent Complications; 2) Yoga based lifestyle to reduce Stress, Aggression and Substance Abuse in Youth; 3) Yoga Based lifestyle for Prevention and Management of Infections; 4) Yoga based lifestyle for preventing pregnancy related complications.

RESULTS

In category 1, i.e. where yoga based lifestyle has been utilized to prevent complications and manage common non-communicable diseases (NCDs), we found that 9 studies satisfied the criteria out of these 9 studies, 8 were randomized controlled studies and 1 was a non-randomized controlled trial. All the studies pointed towards favorable effect of yoga based lifestyle or yoga techniques towards prevention and management of NCDs and their complications.

In category 2, where efficacy of Yoga based lifestyle was assessed to reduce stress, aggression and substance abuse in youth, it was observed that there were total of 8 studies assessing the same, 6 were randomized controlled studies and 2 were non-randomized controlled trials. All studies found beneficial effects of yoga on stress, aggression and substance abuse in youth.

In category 3, which tested usefulness of yoga based lifestyle for prevention and management of infections, it was observed that only two RCTs tested yoga based lifestyle in management of infections but other 10 studies (4 RCTs, 3 Non-randomized controlled studies and 3 reviews) pointed towards indirect beneficial effects of yoga in managing infections.

Category 4 dealt with application of Yoga based lifestyle for preventing pregnancy related complications. Three RCTs satisfied these criteria. All three RCTs found beneficial effects Yoga based lifestyle in preventing pregnancy related complications.

Detailed discussion on these studies under respective categories is provided below:

DISCUSSION

Yoga Based Lifestyle to Manage Common NCDs and Prevent Complications

Transcendental Meditation (TM) program has been found to decrease CAD risk factors, cardiovascular morbidity (Schneider et al., 1995; Alexander et al., 1996), carotid atherosclerosis (Castillo-Richmond et al., 2000), and mortality (Schneider et al., 1996; Alexander et al., 1994). Intensive yoga based life style modification program have been shown to retard coronary atherosclerosis (Mahajan, Reddy & Sachdeva, 1991; Manchanda, 2000). We found a

reduction in various risk factors and enhancement of left ventricular rejection fraction in patients of coronary artery disease who underwent CABG (coronary artery bypass grafting), after one year of yoga based lifestyle intervention (Raghuram, 2014). Similarly, in a randomized controlled study on 277 type 2 diabetic patients, it was observed that nine month of YBL intervention led to better reduction in oral hypoglycemic medication requirement and LDL, with better increase of HDL than exercise based life style; yoga based life style modification program was similar in efficacy to exercise-based life style modification in reducing blood glucose, HbA1c, triglycerides, total cholesterol and VLDL (Nagarathna et al., 2012).

Yoga Based Lifestyle to Reduce Stress, Aggression and Substance Abuse in Youth

A randomized controlled trial showed that integrated yoga intervention of 8 weeks lead to significant reduction in verbal aggression of young adults (Deshpande, Nagendra & Raghuram, 2008). Studies have reported significant improvements in negative emotions including tension-anxiety, depression-dejection, anger-hostility, fatigue-inertia, and confusion-bewilderment. (Michalsen et al., 2005; Lavey et al., 2005) Another study compared African dance and Hatha yoga and found reduction in perceived stress and negative affect with both these practices but reduced cortisol levels in the hatha yoga group. (West et al., 2004) Yoga also helps reduced impulsive behavior and brings better control over anger (Jensen & Kenny, 2004; Noggle, Steiner, Minami & Khalsa, 2012). Yoga based training has also shown promise in the treatment for smoking cessations and substance use disorders (Bowen et al., 2009; Brewer et al., 2011).

Yoga Based lifestyle for Prevention and Management of Infections

Consistent practice of yogic breathing techniques (*pranayama*) increases the lung's airflow, air capacity, stamina and efficiency. A randomized controlled trial tested the effect of 2 month of yoga intervention on symptom scores, bodyweight, FVC, FEV(1), FEV(1)/FVC%, sputum microscopy, sputum culture, and postero-anterior view of the chest x ray. It was observed that yoga group showed significant improvement in level of infection, radiographic picture, FVC, weight gain and reduced symptoms. Significantly more patients in the yoga group showed sputum conversion based on microscopy on days 30 and 45 compared to the control (breath awareness) group (Visweswaraiiah & Telles, 2004). A study (Gupta, Telles & Balkrishna, 2011) assessed blood oxygen saturation before, during and after two yoga breathing techniques; high frequency yoga breathing (*Kapalabhati*) and breath awareness in 29 healthy male volunteers with ages ranging between 17 and 32 years. They observed a significant increase ($P < 0.01$) in oxygen saturation during the 33 min session of high frequency yoga breathing. Another study compared oxygen consumption during the short *kumbhaka* (timed breath holding, 22.2 % of the respiratory cycle) variety of *Ujjayi pranayama*, and the other the long *kumbhaka* (50.4 % of the respiratory cycle) variety of *Ujjayi* in ten healthy volunteers between 28-59 years of age. It was observed that short *kumbhaka ujjayi* caused a statistically significant increase (52%) in the oxygen consumption (and metabolic rate) while the long *kumbhaka ujjayi* caused lowering of the oxygen consumption (by 19%) and metabolic rate (Telles & Desiraju, 1991). Yoga practices have been also been shown to improve the redox status. Another study, was conducted on healthy male volunteers divided into two groups viz. yoga ($n = 34$) and control group ($n = 08$). In addition to their routine activities, the yoga group practiced *yogasanas*, *pranayama* and meditation for 3 months and control group followed the usual routine. Reduced glutathione and total antioxidant status increased significantly ($P < 0.001$) where as glutathione peroxidase activity ($P < 0.001$), plasma concentration level of malondialdehyde ($P < 0.01$) and oxidized glutathione ($P < 0.01$) decreased significantly in yoga group

after completion of 3 months; peripheral arterial oxygen saturation also increased in the yoga group at the same time (Pal, Singh & Saha, 2011). Another yogic breathing technique called *Sudarshana kriya* (SK), which involves breathing in three different rhythms, has been shown to lower blood lactate levels and offer better antioxidant defense (Sharma et al., 2003). In another study, the effect of SK was studied at the transcriptional level of the antioxidant enzymes (Singh et al., 2008). There was a significant increase in expression of glutathione-S-transferase in practitioners of SK as compared to the normal controls along with significant increase in anti-apoptotic Cox-2 and HSP-70. A non-significant increase was observed in the expression of anti-oxidant Cu-Zn SOD, Mn SOD, Glutathione peroxidase and Catalase genes in practitioners. Although the aging-related hTERT and anti-apoptotic Bcl-2 also showed increasing trends in SK practitioners, it was not statistically significant.

Yoga-derived breathing has been reported to improve gas exchange in patients with chronic heart failure and in participants exposed to high-altitude hypoxia, it has also been used for increasing oxygenation in patients suffering from chronic obstructive pulmonary diseases (Pomidori et al., 2009). Another study found that oscillating airflow produced by humming bee breath (*Bhramari pranayama*) enhanced sinus ventilation and thereby increase nasal nitric oxide (NO) levels in ten healthy subjects. NO increased 15-fold during humming compared with quiet exhalation (Weitzberg & Lundberg, 2002). Minvaleeva et al, studied changes in hepatic arterial inflow and venous outflow in 33 subjects during plough posture (*Halasana*). They found that, during this position, the minute blood filling of the liver through the hepatic artery and portal vein remained unchanged while there occurred monophasic nonpulsatory or pulsatory two-phase hepatic vein outflow instead of the usual triphasic outflow with a partial return of blood to the liver. After the plough position, the common triphasic hepatic vein outflow was fully restored; a therapeutic effect of this exercise was recorded when the initially changed monophasic hepatic outflow (in a female patient with hepatitis in her case history) became triphasic immediately after exercise (Minvaleev, Kuznetsov & Nozdrachev, 1998).

We assessed the changes in blood oxygen saturation levels during two high frequency yoga breathing techniques called *Bhastrika* and *Kapalabhati* on 10 healthy male volunteers in the age range of 18-30 yrs (group mean \pm S.D., 24.4 \pm 2.8 years) who were divided into two groups (five in each) to perform the two breathing techniques respectively. They had experience of performing these breathing practices for at least 3 months. Their oxygen saturation levels were assessed for 1 minute before and 1 minute during the practice using Mindray MEC-1200 (Shenzhen Mindray Bio-Medical Electronics Co., Ltd. China). We observed a significant increase in oxygen saturation during the practices of both *Bhastrika* ($p = 0.009$) and *Kapalabhati* ($p = 0.012$) as compared to the baseline values (Bhargav, Kashinath, Nagarathna & Nagendra, 2012). In another recent study, we demonstrated significant increase in oxy-hemoglobin levels in the pre-frontal cortices of 18 healthy volunteers during a high frequency yoga breathing called *Kapalabhati* using functional near infrared spectroscopy (Bhargav, Nagendra, Gangadhar & Nagarathna, 2014).

Pranic Energization Technique (PET) is another technique, where the mind is focused and made sensitive to appreciate subtle nerve impulse of touch sensation and then *prāna* (subtle energy) is systematically moved and balanced throughout the body. This technique of PET is also proposed to be beneficial in reducing radiation induced side effects such as DNA damage by reducing oxidative stress in cancer patients (Pandey, 2012; Ram et al., 2013).

Based on above mentioned evidence base, following yogic breathing practices (done for ~25 minutes three times in a day until infection is controlled) can be recommended for increasing oxygenation to combat acute infections.

Yoga Based Lifestyle for Preventing Pregnancy Related Complications

In a randomized controlled study, sixty-eight high-risk pregnant women were recruited from two maternity hospitals in Bengaluru, India and were randomized into yoga and control groups. The yoga group (n = 30) received standard care plus one-hour yoga sessions, three times a week, from the 12th to the 28th week of gestation. The control group (n = 38) received standard care plus conventional antenatal exercises (walking) during the same period. Significantly fewer pregnancy induced hypertension (PIH), preeclampsia, gestational diabetes (GDM) and intrauterine growth restriction (IUGR) cases were observed in the yoga group. Significantly fewer Small for Gestational Age (SGA) babies and newborns with low APGAR scores were born in the yoga group. Authors concluded that yoga can potentially be an effective therapy in reducing hypertensive related complications of pregnancy and improving fetal outcomes (Rakhshani et al., 2012). Another study on 122 healthy women recruited between the 18th and 20th week of pregnancy at prenatal clinics in Bangalore, India, found that 1 hour-daily practice of yoga were randomized to practicing yoga and deep relaxation or standard prenatal exercises 1-hour daily. It was observed that there was reduction in perceived stress along with increase in the high-frequency band of the heart rate variability spectrum (parasympathetic), and reduction in both the low-frequency band (sympathetic), and the low-frequency to high-frequency ratio were in yoga group as compared to the control (Satyapriya, Nagendra, Nagarathna & Padmalatha, 2009). Another randomized trial was conducted on seventy four primigravida Thai women who were equally divided into two groups (experimental and control). The yoga program involved six, 1-h sessions at prescribed weeks of gestation. The experimental group was found to have higher levels of maternal comfort during labor and 2h post-labor, and experienced less subject evaluated labor pain than the control group, in yoga group there was shorter duration of the first stage of labor, as well as the total time of labor (Chuntharapat, Petpichetchian & Hatthakit, 2008).

Yoga Module for Prevention of Common Medical Emergencies

Basic understanding behind yoga based lifestyle is that all distressful responses to demanding situations of life (short term or long standing suppressed), are nothing but heightened emotions such as depression, anxiety or anger. All emotions trigger the same stress adaptation reflex pathway. It is known that chronic stresses at the back of most of the life style disorders and acute stresses could trigger emergencies. Yoga looks at all emotions as uncontrolled speeded up rewinding of thoughts in the mind. Hence the entire concept of YBL is based on calming down the mind; this in turn offers deep rest to each and every cell in the body to promote normalcy by utilizing simple mind-body techniques of physical postures, regulated breathing, relaxation and meditations.

Based on the discussions made above, following yoga module (performed daily for 60 minutes) should be useful in reducing psychological stress, improving immunity and preventing medical emergencies. This Yoga module was derived by selecting the most common and most feasible practices that were found in our literature survey.

(1) Breathing techniques (*Prānāyāma*, total ~ 20-minute session)

- i. Kapalabhati Breathing: 80-120 strokes per minute for 2 minutes followed by gap of 1 minute and repeat the cycle one more time ~ 6 minutes.
- ii. Bhastrika Breathing: 20 strokes followed by gap of 1 minute and repeat the cycle 3 times ~ 6 minutes.

- iii. Alternate nostril breathing: 12 rounds 1 cycle ~ 5 minutes.
- iv. Ujjayi breathing: 12 rounds one cycle ~ 3 minutes.
- v. Humming bee breath (*bhramari*): 12 rounds 1 cycle ~ 3 minutes.

(2) Physical postures (*Āsanas*; 1 minute each, total ~ 15-minute session)—to be performed as follows:

- i. Standing *āsanas*— Whole joint loosening followed by *Surya Namaskāra* (Sun Salutation) in slow mode with maintenance of each posture for 10 breaths; hand-to-foot pose (*Pādahastāsana*); and half-waist-rotation pose (*Ardha Kati Chakrāsana*; 1 minute each side)
- ii. Sitting *āsanas*—half-spinal-twist pose (*Ardha-matsyendrāsana*), twisted pose (*Vakrāsana*), hare pose (*Shashānkāsana*), and back-stretching pose (*Paschimottānāsana*)
- iii. Prone *āsanas*—crocodile pose (*Makarāsana*) and cobra pose (*Bhujangāsana*)
- iv. Supine *āsanas*—shoulder stand pose (*Sarvāṅgāsana*); plough pose (*Halāsana*); knees-to-ear pose (*Karnapidāsana*); wind relieving pose (*Pawanmuktāsana*); and bridge pose (*Setubandhāsana*)

(3) Meditations—Kundalini Yoga, *Om* Meditation, Pranic Energization Technique and cyclic meditation for 15 minutes, once per day

(4) Guided relaxation (*Savāsana*) and *YogaNidra* for 10 minutes at the end of *āsanas* and *prānāyāmas*.

CONCLUSION

Yoga based lifestyle has the potential to prevent common medical emergencies.

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