Effect of Kapalbhati on pelvic floor muscle strength in menopausal females

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Received: 10 May Revised: 18 May Accepted: 26 May

Abstract

Background: Most females attain menopause by the age of 40 to 58 years leading to many physiological changes. It often accompanies alterations in the functioning of female pelvic floor. Change in lifestyle with a good health programme will reduce or minimize discomforts associated with menopause. Evidences suggest that Kapalbhati has effect on core muscles and cardiovascular parameters but lack of evidences regarding its effect on Pelvic Floor Muscle (PFM) strength. Objective: To assess the effect of Kapalbhati on PFM strength using Perineometer and Brink Score in Interventional and Control Group. Method: This randomized controlled trial was done on 33 menopausal females between 40-65 years. Subjects were randomly allocated to either interventional group (Group A) or control group (Group B). Group A was given Kapalbhati for 5 days/week for 4 weeks along with generalized exercises. Group B was given only generalized exercises. Primary outcome measures were to assess PFM strength using Perineometer and Brink Score readings. Statistical analysis was carried out at the confidence interval of 95%. Results: The mean age of females in group A was 52.38±5.78 and for Group B was 53.88±6.41. There was significant improvement (p<0.05) seen in PFM strength using Perineometer and Brink Score in interventional group whereas control group showed significant reduction (p<0.05) in PFM strength using Perineometer readings. Group A showed significantly more improvement in both outcome measures than group B. Conclusion: Study concluded that Pelvic floor muscle strength increased after practicing Kapalbhati for 4 weeks. So, Kapalbhati can be practiced regularly to avoid further complications after menopause and preserve the PFM strength.

Keywords: Kapalbhati, Menopause, Pelvic muscle strength, Perineometer.

Introduction: Increasing age is a natural and normal physiological phenomenon occurring in a female’s life, which brings menopause in her midlife. All the causes to menopause are yet unknown to the humankind. A lot of misunderstandings and myths surround this natural process. Most of the women feel embarrassed about this. They not only avoid discussion on this topic but even refrain from collection of relevant information to address medical issues accompanying it. According to WHO, women having menstrual blood loss stopped one year back or stopped getting menses because of surgical or medical interventions are said to have attained menopause.
Most of the organs affected because of menopause have a direct relationship with the muscles of the pelvic floor.

Menopause is a normal and steady process. Here, the ovaries curtail female hormone production i.e. progesterone and estrogen. Most females attain menopause naturally during the age of 40 to 58 [2]. It is an unavoidable phase of reproductive life. There are a lot of changes occurring within the body because of menopause and troublesome symptoms like vasomotor, aches and pains, sleep disturbances, fatigue, incontinence, prolapse, sarcopenia, osteoporosis, pathological and neurological illness, etc. may increase. The shortage of estrogen after menopause tends to increase the cardiovascular disease risk factors [3]. The decline in circulating estrogen together with age-related changes may result in uro-gynaecological dysfunction for these women.

Menopausal incontinence is a major issue at this age. Causes for menopausal incontinence may be weak pelvic floor muscles, prolapse, less bladder elasticity, estrogen depletion or weight gain which are all related to menopause. The prevalence rate of female sexual dysfunction and urinary incontinence was found to be 52.5% & 14.6% respectively [4].

Change in lifestyle along with a good health programme prescribed by competent medical professionals will reduce or minimize the discomforts associated with menopause. A square and wholesome diet should be eaten.

The pelvic floor is a cone-shaped musculature arrangement. Pelvic floor diaphragm is vital and provides support for pelvic organs and for maintenance of the continence being a component of the anal and urinary sphincters and it provides resistance to increase in intra-pelvic or abdominal pressure during activities such as lifting heavy objects, sneezing or coughing. If these muscles are sagged or deformed due to hormonal and other changes after menopause, body loses tautness and obe, or age-related sagging is observed. The muscles of pelvic floor play a vital role in stabilization of lumbar region and helps in unloading the spine hence, PFM exercises are effective in treating lower back pain [5]. Training of pelvic floor muscles combined with transverse abdominis muscle has an effect on quality of life in females with incontinence [6].

Diaphragm is a dome-shaped muscle underneath the ribcage, and plays an important role in breathing. On contraction, it descends increasing the vertical diameter of the thorax. The origin of transverses abdominis connects with the costal part of the diaphragm [7]. Contraction of the transverses abdominis activates the pelvic floor muscles (PFM).

While breathing in, the diaphragm flattens out and pushes the abdominal structures down towards the pelvis. When breathing out, the diaphragm relaxes and moves up towards the heart, the organs also move up and the pelvic floor muscles contract. Hence, during exhalation, the abdominal muscles relax and shortening of pelvic muscles occur [8]. Thus, it can be safely said that movement of diaphragm can be used as an exercise to create an effect on PFM for their strengthening.
The word Kapalbhati is a conjunction of two different words. Kapal i.e. skull consists of all the underlying organs and Bhati means shining or illuminating. Kapalbhati is one of the rapid breathing techniques, known as autonomic inhalation technique [9]. During forceful exhalation, the air is forced out of the lungs since the diaphragm is moved in upwardly direction by increase in pressure inside abdomen through co-operative act of muscles of pelvic floor and abdomen. Events in the early expiratory maneuver are said to be effort dependent, most important factor is the increase in abdominal pressure [10].

Kapalbhati ultimately energize and activate pelvic floor muscles which otherwise are rarely used and thus seldom get a chance to revitalize them. So far there are no studies which directly show a relationship between Kapalbhati and pelvic floor muscle strength. Hence the objectives of this study were to assess the effect of Kapalbhati on PFM strength using Perineometer and Brink Score.

**Materials And Method:** This randomized controlled trial was conducted at Dr. D. Y. Patil College of Physiotherapy, Pune, India with 33 participants who were divided in two groups using simple random allocation using chit method. Ethical clearance was taken from the Institutional Sub Ethics committee. Written Informed Consent was taken from all the participants. The sample size was calculated using the software Primer with power 80 % with 95 % CI. Females with urinary tract infection, incontinence, CA cervix, history of grade II, and III UV prolapse, unstable BP or DM were excluded from the study. Subjects in the Group A received Kapalbhati with conventional exercises and Group B received conventional exercises alone.

**Outcome Measures:** Brink Score and Perineometer reading was taken to assess Pelvic Floor Muscle Strength pre and post treatment. Privacy was maintained for all participants and asked to empty bladder before the test. Participants were made to lie in crook lying. Therapist placed the index finger vertically into the vagina with palm facing down, they were then asked to squeeze around the fingers. Scoring was done according to the Brink scale. For Perineometer readings, the sensor probe was covered with a contraceptive sheath and this deflated sensor was inserted into the vagina. Pressure in the sensor was raised until subject got the feeling of maximum inflation of the sensor and was maintained by closing the pressure releasing knob. Participants were then instructed to contract the pelvic floor muscles and squeeze around the probe. Three trials were given and highest reading was considered.
The subjects in interventional group performed Kapalbhati along with conventional exercises for 5 days a week for 4 weeks. Participants in both groups were asked to perform 10 exercises namely Bhujangasana, ArdhaMatsyendrasana, Marjarasana, Ushtrasana, Naukasana, Gomukhasana, Utkatasana, Paschimottasana, Veerbhadrasana, Setu-bandh Sarvangasana. 3 sets of each asana were performed by them with a holding time of 10 seconds. A total of 5 minutes were required to perform the exercises. The study period was from June 2018-December 2018 and no participant reported any adverse effects due to the use of Perineometer.

**Statistical Analysis:** Pre and post treatment score for both the groups were compared. Within the group comparison was done by paired t-test and between groups comparison was done by t-test.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Group A (Interventional group) n = 16</th>
<th>Group B (Control group) n = 17</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Age</td>
<td>52.38±5.78</td>
<td>53.88±6.41</td>
<td>p=0.484</td>
</tr>
<tr>
<td>Mean Weight</td>
<td>69.31±12.31</td>
<td>66.59±14.55</td>
<td>p=0.567</td>
</tr>
<tr>
<td>Mean BMI</td>
<td>28.11±4.82</td>
<td>26.93±5.37</td>
<td>p=0.512</td>
</tr>
<tr>
<td>Mean Menopausal years</td>
<td>6.62±5.83</td>
<td>8.17±4.78</td>
<td>p=0.409</td>
</tr>
</tbody>
</table>

**Figure 1: Flow-Chart of participants and loss of follow-up during the study**

Reason for dropouts:
1. Underwent Hysterectomy (n=1)
2. Diagnosed with DVT (n=1)
3. Irregularity in sessions (n=1)
4. Loss of follow-up (n=3)

Total number of subject completed the study (n=33)

Group A (n=16) Group B (n=17)
**Graph 2: Comparison of perineometer reading in 2 groups**

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
</tr>
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<tbody>
<tr>
<td><strong>BRINK SCORE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRE</td>
<td>7.94</td>
<td>7.94</td>
</tr>
<tr>
<td>POST</td>
<td>9.38</td>
<td>7.65</td>
</tr>
<tr>
<td><strong>PERINEOMETER READINGS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRE</td>
<td>3.62</td>
<td>4.11</td>
</tr>
<tr>
<td>POST</td>
<td>5.75</td>
<td>3.3</td>
</tr>
</tbody>
</table>

**Results:** Baseline demographic data was assessed prior to the intervention, which showed no significant difference in both groups. Also, pre value of Brink Score and Perineometer score of both groups showed no significant difference as p=0.996 and p= 0.63 respectively. This showed both groups were comparable. Graph 1 showed significant improvement in Brink score of Group A as the p value observed was <0.005. Group B showed no significant improvement in brink score as p value observed was 0.13. When post values of both groups were compared, significant improvement in PFM strength was noticed in Group A as compared to Group B (p=0.026). Group A showed significant improvement in Perineometer readings at p <0.001 whereas Group B did not show any improvement. Post value showed significant improvement in PFM strength in Group A (p=0.012). Thus, Group A showed significant improvement in both outcome measures when mean difference was compared with Group B.

**Discussion:** Aim of the study was to determine the effect of Kapalbhati on the strength of PFM in menopausal females. Statistically significant improvement was noticed in the Brink Score and Perineometer reading after this study. Both, Brink Score and Perineometer reading are the
indicators of pelvic floor muscle strength. Brink scale has highest inter-rater reliability, 94% agreement, on pressure \[11\]. P. J. Isherwood et al, (2000) stated that there is a good quality agreement between perineometre as well as digital examination of pelvic floor muscle strength. Kappa value of 0.73 indicated considerable agreement between the two methods. Gynecological examination helps to identify females' defects of the pelvic floor region, and those with the threat of prolapse \[12\]. The reason for improvement may be that Kapalbhati involves contractions of the muscles of abdomen with vigorous exhalation coupled with natural or passive inhalation. Kapalbhati can be described as abdomino-respiratory autonomic exercise. This energizes receptors of the abdominal gastrointestinal, abdominal and respiratory systems. Stimulation of afferents, efferent, and effectors occurs. Cortex and centers in brain-stem are also affected. There is synchronous increase in central nervous system, autonomic nervous system, pineal gland and hypothalamus discharge to all the vital body parts along with the processes related to endocrine and metabolism.

Different yogic breathing practices produce different physiological effects on the human body. Dinesh Thangavel et al, (2015), in his study stated that fast breathing exercises, when practiced on regular basis for longer durations, produce parasympatho dominance as compared to the shorter duration training. This evolves sympathetic activities \[13\]. As parasympathetic nervous system works to nourish, heal and regenerate the body. The system also helps in elimination of waste.

Hankyu Park et al, (2015) further proved that breathing certainly has a connection with the movement of pelvic floor muscles. This relation can be proved by two examples: (a) The muscles contracted when urine passage has to be restricted or suppressed due to some reasons (b) Urine passage after restricting the same for a longer period. In a study by Raizada et al, (2008), it has been stated that the key role of the pelvic floor muscles includes the continence maintenance and the support of abdominal contents. Latest studies have stated supplementary role of pelvic floor muscles in assistance in ventilation \[14\].

Madill and McLean, (2006) have defined the relationship between the muscles of pelvic floor region, activation of abdominal muscle and intra-vaginal pressure during movement of the pelvic floor muscles in healthy women. The authors have concluded that abdominal muscles in the continent females considerably affected the lower intra-vaginal pressure during the voluntary contractions of pelvic floor muscles. Authors have further implied that effective contraction of pelvic floor muscles was not achievable during relaxation of deep abdominal muscles \[15\]. Sapsford et al, (2001) also confirmed that the voluntary activity in abdominal muscles resulted in an increased activity of pelvic floor muscles. Hence it was advised to keep abdominal muscles in alert condition while performing the pelvic floor exercises as it might affect performance of the exercises. In this regard, a study by Caufriez et al, (1997) conducted via transverses abdominis activation has been advised for the treatment of pelvic floor disorders. He concluded that the Abdominal Hypopressive Technique relaxed diaphragm, decreased the pressure inside abdomen and it may also activate the muscles in the pelvic floor and abdominal region simultaneously \[16\]. A study by Pandit et al, (2000) brought out that there is an age-related loss of nerve density and number of muscle cells in the striated urogenital sphincter \[17\]. Role of
Kapalbhati has also been highlighted in reduction of abdominal fat indicated by the circumference of hip and waist and abdominal skin fold thickness in one of the study by Kekan D, (2013) [18].

Abdominal cavity is of balloon shape. There are abdominal muscles at the right side & front portion. Diaphragm lies in the upper part of the abdomen and muscles of pelvic floor occupy the lower portion. Muscles of Pelvic floor do not contract on their own but move in tandem with related muscles around the structures of abdomen. Intra-abdominal pressure is developed because of inhalation of breath, talking or coughing. This pressure is distributed in every direction through the related organs and ascites. Muscles of the abdomen, pelvic floor and the diaphragm contract simultaneously and protect the underlying organs against this pressure [14]. Study by Hankyu Park et al, (2015) established that the contraction of the muscles of the pelvic floor is drawn into movement of diaphragm and further affects the function of pulmonary. Correlation between pelvic floor muscles and breathing has well been proved by them [19].

Pelvic floor muscles are contracted during the phase of strong exhalation and in this process, intra-abdominal pressure escalates resulting in upward diaphragmatic movement. The pelvic floor muscles can therefore be said to be responsible for reacting and controlling the changes in intra-abdominal pressure together with the muscles of abdomen and the diaphragm. Neumann & Gill, (2002) brought out that contraction of the pelvic floor muscles leads to the activation of the internal oblique and the transverse abdominis. It also resulted in raising the intra-abdominal pressurë by 6 mm of Hg. In support of this, Sapsford also confirmed that the pelvic floor muscles actively participate in the changes of intra-abdominal pressure as well as trunk stability, which is necessary in breathing and coughing. Pelvic floor muscles contract concurrently during the contraction of antero-lateral abdominal muscles and the diaphragm. It can be concluded that pelvic floor muscles do not contract independently but they reacts and control the changes in intra-abdominal pressure by working together in unison with the surrounding muscles of abdomen and the diaphragm, mainly with the antero-lateral muscles of the abdomen [14].

During a pelvic floor contraction, the perineal structures (anorectal junction, the vagina and urethra) are pulled anteriorly. The organs are lifted forward and in an upward direction whereas the rectum and vagina are compressed. Sapsford et al. link the pelvic floor muscle EMG activation to increase in establishment of abdominal muscles. The resulting rise in the pressure inside the abdomen generates activation of pelvic floor muscles to support the pelvic organs and the abdominal structures [18].

The abdominal circumference remained steady because the diaphragm and pelvic floor muscles limit the contents of abdomen, the abdominal muscle approximated isometric activity and a little hollowing occurred when hollowing of the lower abdomen was tried [20].

In Kapalbhati, we breathe out forcefully and that too, intentionally. The abdominal muscles along with diaphragm and other organs, contract forcefully. This increases the pressure on abdomen and makes all the muscles in that region to participate actively. The activity of pelvic floor muscles has been noticed with the activation of some abdominal muscles, selective activity of the transverses abdominis, or simultaneous activation of the transverses abdominis and internal
oblique muscles. And thus, effectiveness of Kapalbhati in strengthening the pelvic floor muscles can be found useful.

A study by Supriya Deshmukh et al, (2017) stated that Kapalbhati helped to improve core strength along with yogasana within four weeks of practice [21]. This finding is complementary to our study and it is seen that Kapalbhati helps in improving pelvic floor strength as the diaphragm forms the roof and pelvic floor forms the floor of the core respectively.

In our study the abdominal strength was not measured. Also, the relation between pelvic floor muscle strength and BMI was not assessed. Further research can be done using EMG analysis of pelvic Floor Muscles to evaluate PFM strength. Also, there can be studies where individual components of brink score can be considered along with assessment of individual strength of abdominal muscles, core strength and pelvic floor muscle strength to differentiate the specific role of each component.

**Conclusion:** The study concluded that Pelvic floor muscle strength increased after practicing Kapalbhati for 4 weeks. So, Kapalbhati can be practiced regularly as a preventive measure to avoid future complications related to pelvic floor muscles in menopausal females.

**Acknowledgement:** I thank the authority of Dr. D.Y. Patil College of Physiotherapy for smooth conduction of study.

**Conflict Of Interest:** Declared none.

**References:**


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