# **SUPPLEMENTARY MATERIAL**

## Supplementary File S1

### *Table 1. Summary of Included Studies*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Study (country)** | **Study Design** | **Patient Population and Age** | **Intervention Description** | **Delivery Method** | **Outcomes Assessed** | **Impact of Intervention on Outcomes** |
| **Middle Income Countries (MICs; including lower and upper middle)** |
| Agarkhedkar *et al*. 2005 [13](India) | CBA | Moderate perennial asthma3-15 years | Specific elimination diet based on results of in-vitro allergy tests for a selected food panel | NS | 1. IgE titres | 1. + (for 17 patients), ↔ (for 6 patients),- (for 1 patient) |
| Aggarwal *et al*. 2013[14] (India) | RCT | Patients with bronchial asthma 20-45 years | Yoga (pranayama), breathing exercises and normal medical treatment, compared to the control group who did not receive breathing training | Trained expert | 1. FEV2. FVC3. FEV1/FVC4. PEFR | 1. +2. +3. +4. + |
| Agnihotri *et al.* 2014 [15] (India) | RCT | Non-smokers with mild to moderate persistent asthma12-60 years | Yoga training for 30 minutes every morning (including standard medical treatment), compared to the control group who received standard medical treatment only | Yoga trainer | 1. PEFR2. Asthma control scores3. Hb4. TLC5. Polymorphs6. Lymphocytes7. Eosinophils8. Monocytes9. Superoxide dismutase 10. QoL | 1. +2. +3. +4. +5. +6. +7. +8. +9. +10. + |
| Agnihotri *et al.* 2016 [16](India) | RCT | Non-smokers with mild to moderate persistent bronchial asthma12-60 years | Yoga intervention along with standard medical treatment, compared to the control group who received standard medical treatment | NS | 1. FEV2. FVC3. FEV1/FVC4. PEFR | 1. +2. +3. +4. + |
| Agrawal et al. 2005[17](India) | RCT | Patients with persistent asthma5-12 years | Individualised written home-management plan (including standard asthma therapy), compared to the control group who received standard asthma therapy only | Trained physician and social scientist | 1. The number of acute asthma events requiring emergency hospital visits2. The number of school days missed3. The number of night time awakenings4. Symptom score | 1. +2. +3. +4. + |
| Behera *et al. 2006* [18] (India) | RCT | Asthma patients 18-60 years | A self-care manual on bronchial asthma, compared to no specific instructions | NS | 1. Symptom score2. Patient knowledge3. Self-care measures 4. Influencing factors5. Indices of asthma morbidity | 1. +2. +3. +4. +5. + |
| Behera *et al. 2008*[19] (India) | RCT | Patients with bronchial asthma Mean age of 36.72 years in the intervention group, and 34.33 years in the control group | Self-care manual stating details of asthma triggers and ways to avoid triggers, compared to the control group who received no access to self-care manuals | Investigators | 1. Number of patients whose symptoms were aggravated by listed factors2. Number of patients avoiding triggers | 1. +2. + |
| Ghosh *et al. 1998* [20](India) | RCT | Patients with chronic asthma and at least one hospital visit in the last year10-45 years | Self-management training, compared to the control group who did not receive training sessions | Social scientist and physician | 1. PEFR2. Loss of productive days3. Hospital days4. % hospitalized5. ER visits6. Intervention costs7. Direct costs8. Indirect costs9. Average costs | 1. +2. +3. +4. +5. +6. +7. +8. +9. + |
| Grover *et al. 2002* [21](India) | RCT | Patients with asthma and at least two years of illness18-45 years | CBT, compared with standard pharmacological treatment | NS | 1. PEFR2. Symptom diary3. QoL | 1. +2. +3. + |
| Grover *et al. 2016*[22](India) | RCT | Patients with asthma and at least two hospital visits in the last 12 months7-12 years | PowerPoint slides and a child workbook, compared to the control group who received the usual standard of care (a standard information pack given before usual doctor’s appointment) | Asthma educator | 1. Asthma knowledge of caregiver and child2. Asthma control3. Drug adherence4. Inhaler technique5. Action plan ownership 6. PACQL (QoL) | 1. +2. +3. +4. +5. + 6. + |
| Jolly *et al. 2015* [23](India) | Randomised parallel group study | Patients with respiratory disorders>18 years | Written instructions regarding correct inhaler technique of MDI, compared with a practical demonstration  | Instructors and trained investigators | 1. Median score for inhaler technique | 1. + |
| Mandanmohan *et al. 2003*[24] (India) | RCT | School children with no yoga training experience and no respiratory or cardiac diseases12-15 years | Yoga training, compared to the control group who did not receive any yoga training  | NS | 1. FEV 2. FEV13. PEFR4. Maximum expiratory pressure5. Maximum inspiratory pressure6. Hand grip strength7. Hand grip endurance | 1. +2. +3. +4. +5. +6. +7. + |
| Maazuddin *et al. 2014*[25] (India) | CBA | Patients with asthma or COPD and prescribed bronchodilators and/or corticosteroidsAge NS | Personalised health education and training regarding inhaler use | Pharmacists | 1. Symptom score2. Activity score3. Impact score4. Total score | 1. +2. +3. +4. + |
| Kumar *et al. 2013*[26](India) | CBA  | Teachers24-57 years | Educational booklet on asthma management around developing MDI skills | NS | 1. Performance score | 1. + |
| Lathadevi *et al. 2012* [27](India) | RCT | Patients with asthma18-60 years | Yoga training, compared to control group who did not receive any yoga training | NS | 1. FEV1 2. FVC3. FEV1/FVC 4. PEFR 5. Chest expansion6. 40mmHg endurance test7. Respiratory rate | 1. +2. +3. +4. +5. +6. +7. + |
| Mishra *et al. 2005*[28](India) | RCT  | Patients with mild and persistent asthma >14 years | Asthma awareness education programme, compared to those who did not receive the education programme | NS | 1. Frequency of asthma attacks prior to intervention2. Hospitalization 3. PEFR | 1. + 2. + 3. + |
| Rao *et al.* *2014*[29] (India) | CBA | Patients with bronchial asthma 18-70 years | Nature cure therapy, diet therapy and yoga therapy | NS  | 1. FEV12. FVC3. FEV1/FVC4. PEFR5. MVV | 1. +2. +3. +4. +5. + |
| Saji *et al.2012* [30](India) | RCT | Patients with moderate to severe asthma18-65 years | Counselling points such as procedures to be followed during inhalation therapy, self-management of acute exacerbations, time drugs should be taken and dosage, compared to the non-counselled control group | Counsellor  | 1. FEV12. PEFR3. FVC4. QoL | 1. +2. +3. +4. + |
| Sathyaprabha et al. 2001 [31] (India) | CBA | Bronchial asthma patientsMen mean age 40 years; women mean age 35 years  | Diet therapy, nature care treatment and yoga therapy | NS  | 1. Vital capacity, FEV1, Maximum voluntary ventilation (MVV), PEFR2. Hb, WBC, RBC3. ESR, absolute eosinophil count | 1. +2. ↔3. + |
| Shanmugam *et al. 2012*[32] (India) | RCT | With asthma diagnosisAge NS | An asthma care diary, asthma education and medication counselling | Clinical pharmacist | 1. PEFR, asthma control scores2. QoL | 1. +2. + |
| Singh *et al*. *1990*[33](India) | RCT | Those diagnosed with asthma, manifesting nocturnal wheeze11-58 years | Pranayama breathing exercises using a Pink City lung exerciser by itself or with additional hot humid air, compared to the control period where a matched placebo device was used | NS  | 1. PEFR2. Frequency of nocturnal wheeze | 1. + (more so in hot air group)2. + |
| Singh *et al. 2012* [34](India)  | RCT | Patients with mild to moderate, and stable asthma18-60 years | Yoga breathing training (pranayama) | Yoga trainer | 1. FVC2. FEV13. PEFR4. MVV5. SVC6. TLCO7. QoL | 1. +2. +3. +4. +5. +6. +7. + |
| Sodhi *et al. 2009*[35](India) | RCT | Non-smokers with mild to moderate asthma. 17-50 years | Yoga training sessions, compared to the control group who did not undertake regular yoga training sessions | Trained yoga instructor | 1. FVC 2. FEV13. PEFR4. Forced mid expiratory flow (FEF) in 0.25-0.75 seconds (FEF25-75)5. FEV1/FVC ratio | 1. +2. +3. +4. +5. + |
| Sodhi *et al. 2014* [36](India) | RCT | Non-smokers with well controlled asthma17-50 years | Yoga training sessions, compared to the control group who did not receive regular yoga training sessions | Trained yoga instructor | 1. Number of attacks2. Severity of attacks3. Dosage of medication4. QoL | 1. +2. +3. +4. + |
| Vempati *et al. 2009*[37](India) | RCT | Patients with mild to moderate asthma>18 years | A yoga-based lifestyle modification intervention, compared to wait-listed control group | NS  | 1. FVC2. FEV13. FEV1/FVC4. PEFR5. Average forced expiratory flow rate during the expulsion of 25–75% of FVC (FEF25–75%)6. Eosinophilic cationic protein7. Exercise-induced bronchoconstriction8. Urinary concentration of prostaglandin D29. QoL | 1. +
2. +
3. +
4. +
5. +
6. ↔
7. +
8. ↔
9. +
 |
| Khan *et al. 2015*[38](Pakistan) | RCT | Patients with newly diagnosed with asthma and COPD >18 years | Improved availability of context-sensitive guidelines and materials for case management including patient education tools for awareness and smoking cessation, compared to control group who received routine care for asthma and COPD case management | NS | 1. FEV1/FVC ratio2. Beta-2 agonist use3. Waking up at night4. Restriction of daytime activity5. Emergency asthma treatment 6. Missed work or school days  | Results not available |
| Wong *et al. 2013*[39] (Malaysia) | RCT | Children with asthma6-17 years | Written asthma action plan, compared to the control group who received verbal counselling on the management of asthma exacerbations only | Investigator | 1. Acute asthma exacerbations2. Patients with controlled asthma3. QoL | 1. ↔2. +3. ↔ |
| **High Income Countries (HICs)** |
| Poureslami *et al 2012*[40] (Canada) | RCT | Patients with asthma and regular medication use 21-87 years | Education via physician-led videos or a patient-generated community video or both, compared to the control group who received an educational pamphlet | NS  | 1. Asthma knowledge2. Correct inhaler use3. Understanding of physician’s instructions  | 1. +2. +3. +  |
| Poureslami *et al.2016*[41] (Canada) | RCT | Patients with asthma and daily medication use21-87 years | Culturally specific educational videos that were either physician-led or community videos, compared to the control group who received and educational pamphlets  | Study facilitators | 1. Skills in appropriate inhaler technique | 1. + |
| Griffiths *et al. 2004* [42]*(UK)* | RCT | Patients with acute asthma4-60 years | A self-management plan and a written action plan, compared to the control group who received a visit promoting standard asthma guidelines | Specialist nurses | 1. % receiving unscheduled care2. Rates of unscheduled care attendance3. Self-management behavior4. QoL | 1. +2. ↔3. ↔4. ↔ |
| Griffiths *et al. 2016*[43]*(UK)* | RCT | Children with asthma and their GPs>3 years | Two theoretically-based educational interventions that were culturally adapted for South Asians | Specialist nurse | 1. Time to first unscheduled contact2. Proportion of participants without unscheduled appointment3. Time to first asthma review in primary care4. Prescription5. QoL | 1. ↔2. ↔3. +4. ↔5. + |
| Moudgil *et al. 2000* [44](UK) | RCT | Asthma patients (both White European and Indian Subcontinent patients)11-59 years | Asthma education programme, individually tailored written self-management plan and peak flow meters, compared to the control group who only attended the beginning and end of the programme, along with their usual care | Educator | 1. Hospital admissions2. GP or deputizing services home3. GP consults 4. Steroids prescription5. Antibiotics prescription6. QoL | 1-5. + (Significant in White European group6. + |
| Tan *et al. 2013*[45] (Singapore) | CBA | Caregivers of children with asthma30-50 years  | Written asthma action plan for caregivers  | Student nurses | 1. Symptom understanding and recognition2. Use of asthma medications3. Consultation and self-management | 1. + 2. + 3. ↔ |

### *Key*

 +: Intervention had a positive impact

**─**: Intervention had a negative impact

↔: Intervention did not produce significant change

### List of abbreviations

CBT: Cognitive behavioural therapy

COPD: Chronic obstructive pulmonary disease

ESR: Erythrocyte sedimentation rate

FEV: Forced expiratory volume

FEV1: Forced expiratory volume in one second

FVC: Forced vital capacity

FEV1/FVC: Forced expiratory volume in one second/forced vital capacity

Hb: Haemoglobin

MDI: Metered-dose inhaler

MVV: Maximum voluntary ventilation

NS: Not specified

PACQL: Paediatric asthma caregiver quality of life

PEFR: Peak expiratory flow rate

QoL: Quality of life

RBC: Red blood cell

RCT: Randomised controlled trial

SVC: Slow vital capacity

TLC: Total lung capacity

TLCO: Transfer factor for the lung for carbon monoxide

WBC: White blood cell

## Supplementary File S2

### *Table 2. Results Summary of Included Studies*

|  |  |  |  |
| --- | --- | --- | --- |
| **Intervention classification of outcome measure** | **Intervention outcome measure** | **Significant improvement** | **No Change** |
| **Physiological symptoms** | IgE titres | 1 study - [13] | 1 study - [13] |
|  | FEV or FEV1 | 10 studies - [14, 16, 24, 27, 29, 30, 31, 34, 35, 37] |  |
|  | FVC | 8 studies - [14, 16, 27, 29, 30, 34, 35, 37]  |  |
|  | FEV1/FVC | 4 studies - [14, 16, 27, 29, 37] |  |
|  | PEFR | 16 studies [14, 15, 16, 20, 21, 24, 27, 28, 29, 30, 31, 32, 33, 34, 35, 37] |  |
|  | MVV | 3 studies - [29, 31, 34] |  |
|  | Chest expansion, 40mm Hg endurance test, and respiratory rate | 1 study [27] |  |
|  | Maximum expiratory pressure, and maximum inspiratory pressure | 1 study - [24] |  |
|  | Hand grip strength, and hand grip endurance | 1 study - [24]  |  |
|  | Hb | 1 study - [15] | 1 study - [31] |
| **Unscheduled impact** | Asthma events / attacks | 3 studies - [17, 28, 36] |  |
|  | Hospitalization / emergency visits and/treatment / unscheduled care | 6 studies - [17, 20, 28, 38, 42, 44] | 2 studies - [42, 43] |
|  | Number of school days missed / productive days lost / restriction of day time activity  | 1 study - [17, 20] |  |
|  | The number of night time awakenings / nocturnal wheeze  | 1 study - [17, 33] |  |
| **Self-reported** | Symptom score  | 5 studies - [17, 18, 19, 21, 25] |  |
|  | Patient knowledge / understanding / recognition | 4 studies - [18, 22, 40, 44] |  |
|  | Asthma control / self-care / self-management / ownership  | 4 studies - [15, 18, 22, 32]  | 1 study - [42] |
|  | QoL | 10 studies - [15, 21, 22, 30, 32, 34, 36, 37, 43, 44] | 2 studies - [39, 42] |
|  | Avoidance of triggers | 1 study - [19] |  |
| **Existing treatment**  | Drug adherence | 1 study - [22] |  |
|  | Prescriptions | 1 study - [44] | 2 studies - [43, 44] |
|  | Inhaler technique / intervention performance score | 1 studies - [22, 23, 40, 41] |  |
| **Intervention Specific** | Cost  | 1 study - [20] |  |
|  | Performance score | 1 study - [26] |  |
|  | Understanding instructions | 1 study - [40] |  |