# **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 asthma  3-15 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. FEV  2. FVC  3. FEV1/FVC  4. PEFR | 1. +  2. +  3. +  4. + |
| Agnihotri *et al.* 2014 [15]  (India) | RCT | Non-smokers with mild to moderate persistent asthma  12-60 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. PEFR  2. Asthma control scores  3. Hb  4. TLC  5. Polymorphs  6. Lymphocytes  7. Eosinophils  8. Monocytes  9. 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 asthma  12-60 years | Yoga intervention along with standard medical treatment, compared to the control group who received standard medical treatment | NS | | 1. FEV  2. FVC  3. FEV1/FVC  4. PEFR | 1. +  2. +  3. +  4. + |
| Agrawal et al. 2005[17]  (India) | RCT | Patients with persistent asthma  5-12 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 visits  2. The number of school days missed  3. The number of night time awakenings  4. 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 score  2. Patient knowledge  3. Self-care measures  4. Influencing factors  5. 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 factors  2. 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 year  10-45 years | Self-management training, compared to the control group who did not receive training sessions | Social scientist and physician | | 1. PEFR  2. Loss of productive days  3. Hospital days  4. % hospitalized  5. ER visits  6. Intervention costs  7. Direct costs  8. Indirect costs  9. 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 illness  18-45 years | CBT, compared with standard pharmacological treatment | NS | | 1. PEFR  2. Symptom diary  3. QoL | 1. +  2. +  3. + |
| Grover *et al. 2016*[22]  (India) | RCT | Patients with asthma and at least two hospital visits in the last 12 months  7-12 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 child  2. Asthma control  3. Drug adherence  4. Inhaler technique  5. 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 diseases  12-15 years | Yoga training, compared to the control group who did not receive any yoga training | NS | | 1. FEV  2. FEV1  3. PEFR  4. Maximum expiratory pressure  5. Maximum inspiratory pressure  6. Hand grip strength  7. 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 corticosteroids  Age NS | Personalised health education and training regarding inhaler use | Pharmacists | | 1. Symptom score  2. Activity score  3. Impact score  4. Total score | 1. +  2. +  3. +  4. + |
| Kumar *et al. 2013*[26]  (India) | CBA | Teachers  24-57 years | Educational booklet on asthma management around developing MDI skills | NS | | 1. Performance score | 1. + |
| Lathadevi *et al. 2012* [27]  (India) | RCT | Patients with asthma  18-60 years | Yoga training, compared to control group who did not receive any yoga training | NS | | 1. FEV1  2. FVC  3. FEV1/FVC  4. PEFR  5. Chest expansion  6. 40mmHg endurance test  7. 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 intervention  2. 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. FEV1  2. FVC  3. FEV1/FVC  4. PEFR  5. MVV | 1. +  2. +  3. +  4. +  5. + |
| Saji *et al.2012* [30]  (India) | RCT | Patients with moderate to severe asthma  18-65 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. FEV1  2. PEFR  3. FVC  4. QoL | 1. +  2. +  3. +  4. + |
| Sathyaprabha et al. 2001 [31]  (India) | CBA | Bronchial asthma patients  Men 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), PEFR  2. Hb, WBC, RBC  3. ESR, absolute eosinophil count | 1. + 2. ↔  3. + |
| Shanmugam *et al. 2012*[32]  (India) | RCT | With asthma diagnosis  Age NS | An asthma care diary, asthma education and medication counselling | Clinical pharmacist | | 1. PEFR, asthma control scores  2. QoL | 1. + 2. + |
| Singh *et al*. *1990*[33]  (India) | RCT | Those diagnosed with asthma, manifesting nocturnal wheeze  11-58 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. PEFR  2. 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 asthma  18-60 years | Yoga breathing training (pranayama) | Yoga trainer | | 1. FVC  2. FEV1  3. PEFR  4. MVV  5. SVC  6. TLCO  7. 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. FEV1  3. PEFR  4. 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 asthma  17-50 years | Yoga training sessions, compared to the control group who did not receive regular yoga training sessions | Trained yoga instructor | | 1. Number of attacks  2. Severity of attacks  3. Dosage of medication  4. 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. FVC  2. FEV1  3. FEV1/FVC  4. PEFR  5. Average forced expiratory flow rate during the expulsion of 25–75% of FVC (FEF25–75%)  6. Eosinophilic cationic protein  7. Exercise-induced bronchoconstriction  8. Urinary concentration of prostaglandin D2  9. 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 ratio  2. Beta-2 agonist use  3. Waking up at night  4. Restriction of daytime activity  5. Emergency asthma treatment  6. Missed work or school days | Results not available |
| Wong *et al. 2013*[39]  (Malaysia) | RCT | Children with asthma  6-17 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 exacerbations  2. Patients with controlled asthma  3. 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 knowledge  2. Correct inhaler use  3. Understanding of physician’s instructions | | 1. +  2. +  3. + |
| Poureslami *et al.2016*[41]  (Canada) | RCT | Patients with asthma and daily medication use  21-87 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 asthma  4-60 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 care  2. Rates of unscheduled care attendance  3. Self-management behavior  4. 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 contact  2. Proportion of participants without unscheduled appointment  3. Time to first asthma review in primary care  4. Prescription  5. 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 admissions  2. GP or deputizing services home  3. GP consults  4. Steroids prescription  5. Antibiotics prescription  6. QoL | | 1-5. + (Significant in White European group  6. + |
| Tan *et al. 2013*[45]  (Singapore) | CBA | Caregivers of children with asthma  30-50 years | Written asthma action plan for caregivers | Student nurses | 1. Symptom understanding and recognition  2. Use of asthma medications  3. 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] |  |