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8 **Interventions for caregivers of children with food allergy: a systematic review**

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28

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Abstract

Background: Studies have identified that food allergy (FA) in children is related to poorer caregiver quality of life (QoL). However, it is unclear which interventions are most effective at improving outcomes for caregivers of children with FA. This review aimed to identify and determine the efficacy, acceptability and quality of interventions for caregivers of children with FA.

Methods: A systematic search of four databases was conducted to identify studies evaluating any intervention that targeted wellbeing and support in caregivers of children with FA. Studies were not excluded based on design and were rated for quality using the mixed method appraisal tool (MMAT) and the Cochrane risk of bias tool for randomised controlled trials (RCTs).

Results: Fifteen studies met inclusion; eight studies used a pre-test post-test design, four used a post-test design, two were RCTs and one a case-control design. Seven studies were educational interventions, five were psychological, and three involved peer/professional support. All interventions had high participant acceptability; some evidence for cognitive behavioural interventions in supporting mothers was observed. Educational interventions tended to be associated with improvements in FA knowledge. With exception of three studies, most studies were assessed as poor or moderate in terms of quality.

Conclusion: There is a paucity of high-quality research evaluating interventions to improve outcomes in parents of children with FA. Limited evidence suggest that cognitive behavioural interventions could benefit some mothers, but this has not been tested in other populations. Future research should use methodologically sound designs with validated outcome measures.

Keywords: Food allergy, Parents, Caregivers, Intervention, Quality of Life, Wellbeing

Abbreviations

FA	Food allergy
QoL	Quality of life
MMAT	Mixed methods appraisal tool
RCT	Randomised controlled trial
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-analyses

69 AAI

Adrenaline auto-injector

70 CBT

Cognitive behavioural therapy

71

72

73 INTRODUCTION

74 Like all chronic illnesses, a food allergy (FA) diagnosis has emotional, psychological and
75 financial implications¹⁻³. Research has highlighted three challenges unique to caregivers of
76 children with FA⁴. Firstly, children are generally asymptomatic in the absence of the
77 allergen. Some caregivers have stated that the “invisibility” of the FA can result in others not
78 recognising the importance of management plans or responding to requested
79 accommodations for the child with hostility (e.g., accusing parents of being neurotic)^{3,5}.
80 Parents have reported that these negative social interactions increase anxiety and fear of
81 “handing over” care to others³. Numerous studies have reported that although
82 burdensome, parents often feel safer managing the ever-present threat of anaphylaxis
83 alone⁶⁻⁷. This sense of responsibility may have consequences not only for the child, who may
84 miss out on social interactions, but also for the whole family. Gupta et al. identified mothers
85 who stopped working to stay at home with their child due to fears that caregivers in other
86 settings would not provide adequate care⁷.

87
88 Secondly, parents who are instructed to maintain a high level of vigilance as a part of FA
89 management may experience anxiety and impose excessive restrictions on their child.
90 Vigilance behaviours are enhanced in states of anxiety and can often result in unhelpful
91 coping strategies (such as avoiding all situations, regardless of risk of exposure)⁸; reducing
92 these behaviours is sometimes a component of psychological interventions for anxiety (e.g.,
93 dropping safety behaviours in cognitive behavioural therapy for Panic)⁹. Moreover,
94 reactions from accidental exposure to allergens are not uncommon, even when numerous
95 preventative steps have been taken, which may exacerbate parental anxiety and reinforce
96 the perceived need for further vigilance^{10,11}.

97
98 Finally, the unpredictability of FA reactions can provoke negative beliefs around ambiguity
99 among parents. In an analysis of parental understanding of allergy risk and management,
100 Stjerna et al. found that parents feel the need to manage a “death risk”, which depends
101 both on context and on those who are interacting with their child⁵. As this risk is easier to
102 manage when both aspects are familiar, caregivers may actively avoid uncertain
103 environments, even when the overall risk of fatal anaphylaxis is low¹². Given these

challenges, it is perhaps unsurprising that caregivers regularly report poorer mental health, lower self-confidence and impaired quality of life (QoL)^{4,6,13,14}.

In summary, allergy diagnoses are a serious and potentially chronic health difficulty that can negatively impact the lives of those affected as well as their caregivers. The current lack of curative treatments for FA requires caregivers to engage in vigilance behaviours to avoid the allergen, which may be burdensome. Further, these behaviours can impair QoL and provoke anxiety among parents, in turn potentially hindering the child's development and impacting caregivers' relationships. Given the increasing prevalence of allergy diagnosis¹⁵, and the related consequences for individuals with FA and their families, there is a need to better understand what support is helpful to improve caregiver wellbeing. There are no published reviews examining interventions aimed at improving wellbeing in caregivers of children with FA. Improved support for this population has the potential to improve not only caregiver wellbeing, but also allergy management outcomes for children with FA. This study aimed to conduct a review based on a systematic search of the literature examining interventions targeted at improving wellbeing and support in caregivers of children with FA. Specifically, the review sought to summarise the reported efficacy, acceptability and quality of these interventions.

METHODS

This systematic review follows the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines (PRISMA)¹⁶ and was prospectively published (PROSPERO ID: CRD42019140734).

Eligibility criteria

Studies were included on the basis that i) interventions targeted the wellbeing and support of primary caregivers (biological or adoptive or foster) of children with FA (clinician diagnosed or parent-reported), ii) interventions targeting non-primary caregivers (e.g. school staff) or children were included so long as they contained a component addressing parental needs, iii) studies could involve any type of intervention (e.g. psychological, social, behavioural, educational) irrespective of study design, and iv) studies were published in an English-language, peer-reviewed journal. Studies were excluded if i) children had other

chronic health difficulties (with the exception of comorbid atopic conditions) or did not have a diagnosis of FA, ii) caregivers were of children over 18 years (as adult children are less likely to be under the primary care of their parents), or iii) the intervention did not directly target parental outcomes (e.g. studies evaluating adherence to medical treatment plans to benefit children or medical professionals).

Search strategy

Databases were searched from inception and included Web of Science, Psychinfo, Pubmed and CINAHL up until December 18th 2018 (search terms available in supplementary file 1). Papers were screened against the eligibility criteria, initially by title and then abstract, and finally full text where necessary (Figure 1). Additional articles were searched for in reference sections of included studies and using Google scholar.

Data extraction, analysis and synthesis

A standardised data extraction form was created and data were extracted for important characteristics (Table 1 Online Repository). Data from the included studies were initially extracted by the first author and repeated for a randomly selected 20% percent of studies, by the last author with no disagreements observed. The same approach was used for conducting the assessment of study quality. A narrative synthesis of the data structured around the nature and type of intervention was undertaken.

Quality assessment of studies

As studies eligible for this review incorporated both qualitative and quantitative designs, quality assessment was guided by the Mixed Methods Appraisal Tool (MMAT)¹⁷. This is an effective and practical tool for systematic reviews that include varied study designs and mixed methods and has been used in recent reviews in the allergy literature¹⁷. The tool consists of two screening questions, followed by four criteria for appraising study design. The MMAT scores range from 0-100% (where all four criteria are met). For randomised controlled trials (RCTs), quality was also assessed using the Cochrane Risk of Bias tool¹⁸. This tool addresses six domains of potential bias, and assessments are made for multiple items under each domain. These assessments inform an overall judgement about whether the potential risk of bias is low, unclear or high.

RESULTS

Study characteristics

Of the 15 studies involving 6511 participants, seven were conducted in the United States^{10,11,20-24}, three were conducted in the United Kingdom²⁵⁻²⁷, three in mainland Europe²⁸⁻³⁰, one in Canada³¹, and one in Australia³². Eight used a single-group pre-test post-test design^{10,11,21,22,27,28,30,32} and four used a single-group post-test design^{23,24,29,31}. Two studies were RCTs^{20,25} and one used a non-random case control design²⁶. Broadly, the studies' interventions focused on providing education, psychological support to mothers or families, or peer/professional support (Table 1).

Quality assessment

Of the 15 studies which were assessed using the MMAT, one scored 100%²⁵, one scored 75%²⁶, six scored 50%^{10,20,22,28,30,31}, four scored 25%^{11,21,27,32} and three did not meet any of the appraisal criteria and scored 0%^{23,24,29} (supplementary file 2). Two studies used a randomised controlled trial design. Boyle et al. was rated as having an overall low risk of bias²⁵ (supplementary file 3). The primary methodological concerns were the lack of blinding of participants, experimenters and outcome assessors. Additionally, outcome measures were primarily self-reported and unvalidated, with a corroborating measure (salivary response) provided for one outcome in one study²⁵. The authors attempted to reduce bias where possible and reported processes appropriately. Baptist et al. was rated as "unclear" due to failing to report processes such as randomisation, reducing confidence in the reported results²⁰ (supplementary file 3).

Educational interventions

Seven of the 15 reviewed studies reported on the implementation of an educational intervention aimed at parents and caregivers. One study created and ran an educational campaign across a US State, aiming to improve allergy management knowledge both in the public and to caregivers²². They reported a significant increase in knowledge scores at post-test, concluding that provision of information via media outlets was effective. Three studies presented information through varying formats, with one running two face-to-face

workshops, another showing participants educational videos, and the final through engagement with a 2-week online programme (consisting of interactive question and answer sessions and discussion threads)^{10,28,30}. Despite the variation in presentation format and length of intervention, all studies reported increases in food allergy knowledge in participants between pre-test and post-test measures, as well as reporting high levels of satisfaction.

Wahl et al. created a face-to-face training session that was conducted in 247 schools²⁴. Authors aimed to increase food allergy knowledge, as well as increasing perceived competence to care for children with FA. The primary demographic in this study was teachers, but workshops were also attended by parents, caregivers, nurses and administrators. This study did not measure confidence or knowledge increase with formal measures but reported participant feedback on the workshop. They concluded that respondents reported an increase both in knowledge and in confidence in managing FA as a result of the training.

The sixth study used a pre/post-test design to assess whether knowledge of food allergy and psychological wellbeing improved following diagnostic tests and appropriate information and advice given by an allergy specialist. At four-six weeks after the clinic appointment, knowledge of food allergy was significantly greater but there was no significant difference in psychological wellbeing between baseline and follow-up²⁷. Finally, Sicherer et al. targeted the role of information in improving practical provision of care to children with FA¹¹. They assessed correct administering of an adrenaline auto-injector (AAI) as the primary outcome, but also measured reported comfort with treatment and FA knowledge. They reported improvements in the administering of AAI, with fewer errors made by participants, as well as increased FA knowledge and high participant satisfaction that was maintained at one-year follow-up.

Psychological interventions

Five studies evaluated psychological interventions for caregivers of children with FA. Two studies aimed to improve outcomes by targeting parental self-efficacy. The first study ran a series of psychologist-led workshops aiming to present relevant information about allergy

management and facilitate discussion²¹. They reported that the intervention resulted in increased perceived parental competence (self-efficacy) and a reduction in parental burden between pre and post-workshop measures.

The second study ran an RCT aimed at improving self-regulation and QoL²⁰. The authors designed their intervention based on a self-regulation model to support health-related behaviour change³³. Participants in the intervention group received three 25-minute telephone sessions with a trained clinician, to help them to set goals, problem solve and implement coping behaviours. The authors found that QoL improved across four domains (helplessness, anxiety, frustration and confidence), and they concluded that interventions targeting self-efficacy had the potential to improve FA related QoL in caregivers.

Two studies explicitly evaluated the role of Cognitive Behaviour Therapy (CBT) in improving psychological outcomes for mothers of children with FA. Knibb provided a 12-week course of individualised CBT to mothers and found that participants reported a decrease in depression and anxiety symptoms compared to treatment-as-usual control participants²⁶. Another study ran an RCT to evaluate whether a brief, single session of CBT could support a reduction in maternal state anxiety²⁵. They identified a decrease in anxiety only in a subgroup of mothers whose baseline scores were “moderate to severe”.

One additional study assessed the usefulness of psychological therapy for caregivers; Polloni et al. reviewed chart data for therapy offered to 100 attendees at an allergy referral centre²⁹. Although they did not evaluate individual outcomes for type of therapy, they identified the most common reasons for referral (emotional/social problems, difficulties managing food allergies, eating problems and behavioural problems) and observed that 67% of cases reported that psychological therapy made them feel “a bit better”, and 33% “much better”.

Peer/professional support

The final three studies in this review used supportive interventions that did not include formal educational or psychological therapy. Stewart et al. evaluated an online support group for parents of children with FA and assessed qualitative outcomes post-test using

semi-structured interviews³¹. Attendees reported that the group helped them to feel less isolated and allowed them to ask for advice from peers. Rather than targeting parental wellbeing directly, one study examined the role of specialist input in improving psychological wellbeing in parents. Sharma et al. found that the presence of an allergy specialist in a face-to-face support group reduced reported anxiety and helped participants feel more comfortable asking their allergy specialist questions about their child's care²³.

The final study aimed to improve the mental health of parents of children with no previous diagnosis or management of FA by an allergy specialist, by providing training to community paediatricians³². The intervention was developed and delivered by paediatric allergists and dermatologists to address reports that inadequate clinician training results in contradictory medical advice, contributing to parental anxiety¹³. Following the training intervention, the clinicians' consultation plans were assessed for accurate medical guidance. The authors measured knowledge change in clinicians, as well as reported QoL, psychological wellbeing and satisfaction levels among parents who were registered with the clinicians. Although the authors reported that parent participants' mental health improved marginally, these changes were not statistically significant.

DISCUSSION

This review identified 15 studies which aimed to improve the wellbeing and support of caregivers of children with FA. The interventions identified were categorised into three broad themes; educational, psychological and peer/professional support. The majority of educational interventions aimed to address discrepancies in FA knowledge; these studies all reported increased knowledge among their participants. The studies mobilising psychological interventions provided tentative support for the use of a cognitive behavioural models to inform acceptable and effective interventions for mothers of children with FA. Further psychological evidence suggested that targeting parental self-efficacy may be beneficial for improved QoL. Evidence was mixed for the provision of peer/professional support with more convincing findings for support groups with or without specialist input compared with the impact of specialist input alone. Despite the mixed findings, participants largely reported the interventions as acceptable.

Taken together, the 15 studies evaluated in this review point to the relative lack of robust research evaluating psycho-social interventions for this population. When assessed for quality, seven scored between 0 and 25% on the MMAT, six scored 50% and two scored 75-100%. Only two RCTs met the inclusion criteria; of these, only one had low risk of bias. The generally poor methodological quality of reviewed studies, reflected in problematic designs, sampling bias and unvalidated outcome measures, prevent any definitive conclusions about these interventions' efficacy, despite this being one of the main aims of the review.

Nonetheless, these studies suggest implications for researchers and clinicians seeking to improve the psychological wellbeing and support in caregivers of children with FA. These results also imply there is a need for educational input for caregivers and are in line with the broader literature evaluating the needs of parents of children with chronic health difficulties, which suggests that illness-specific education interventions improve parental mental health outcomes³⁴. CBT has been shown to facilitate improvements in the wellbeing of parents of children with other health difficulties (e.g., chronic pain)³⁵ and is currently the recommended treatment in the UK for people struggling with low mood or anxiety³⁶⁻³⁷.

All the studies evaluating educational interventions lacked a control group, greatly reducing their internal validity. It is unclear whether the observed outcomes would have occurred in the absence of the intervention. Given that participants were not randomly allocated to the treatment, observed changes might have been the result of particular group characteristics. Additionally, none of the studies considered the implications of increased knowledge on parental wellbeing. Existing research reports that parents of children with FA have unmet informational needs and that improving access to clear and concise information from a credible source would positively influence parental QoL and reduce perceived stress³⁸⁻⁴⁰. However, this mechanism needs to be empirically evaluated as does the hypothesis that improved knowledge and self-efficacy leads to improvements in ability, given the propensity for current interventions to focus on the former. Finally, all studies may suffer from sampling bias. Each of the reviewed studies used an opportunistic sampling strategy to recruit participants, which may have resulted in a participant pool of caregivers with an interest in the study area, or with higher than average needs. Participation through self-selection reduced the validity of these studies' outcomes. That this problem was constant

across all studies points to a broader challenge in defining the population of interest and accessing a representative sample.

To the authors' knowledge this is the first review seeking to evaluate the efficacy of interventions to improve wellbeing and support in caregivers of children with FA. Although there may be value in considering the separate influence of interventions by "type" (for example, psychological versus educational), this review included all intervention types, which introduced difficulties when comparing studies and prevented meta-analysis. However, this approach was deemed necessary due to the paucity of studies evaluating a single intervention type or therapeutic model. Furthermore, the review included two studies that were aimed at a variety of caregivers (including teachers and the public), which meant that it was not possible to know the extent to which the intervention results applied specifically to parents. However, it was felt that the dearth of research in this area meant that a broader scope was ultimately useful in understanding the wider literature aimed at this population. The heterogeneity of both intervention type and study design also meant meta-analysis was not appropriate.

One of the primary issues with the studies included in this review is the lack of validated outcomes measures utilised. Only a third of studies used FA-specific outcomes; four of which used the Food Allergy Quality of Life-Parental Burden^{20,21,26,32} and one study utilised both the Food Allergy Quality of Life and the Food Allergy Impact Scale²⁵. The lack of utilisation may in part reflect the lack of FA-specific measures outside of quality of life where much existing research has focussed. Clinicians and academics should consider designing and developing, including psychometric evaluation, FA-specific measures to include a diverse range of experiences and participant demographics to ensure validity and reliability. With more holistic measures in place to capture the experiences of individuals living with FA and their caregivers, the academic and clinical community should move towards agreeing a standardised set of outcomes which represent the minimum that should be measured in all trials of FA-interventions which would also enable meta-analysis. Indeed there does exist a Core Outcome Measures in Effectiveness Trials (COMET) Initiative for food allergy although the project is currently underway with results expected in 2023⁴¹.

359

360 The results of this review provide tentative suggestions for interventions to benefit parents
361 of children with FA. However, it remains unclear whether the promising results
362 demonstrated in these early studies are replicable elsewhere. In particular, there is a need
363 for research which uses methodologically robust designs (e.g. RCTs) to test the efficacy of
364 educational and psychological interventions in supporting parents of children with FA.
365 Future research should attempt to recruit more representative samples and determine
366 differences in intervention effects between type of caregiver (e.g. mother, father, adoptive,
367 grandparent), age of child or type of allergen. The samples studied in the literature are
368 disproportionately comprised of white, female, educated and middle-to-high income
369 individuals. FA prevalence rates amongst diverse groups are still unknown⁴². However,
370 preliminary research has suggested that those from minority groups are more likely to
371 experience FA-related anxiety⁴³, and that non-Caucasian children are less likely to be
372 prescribed AAI⁴². Considering the growing consensus of the increased burden on parents of
373 children with FA⁴, it may be important to study populations who might have access to fewer
374 supportive resources. Until these groups are better represented in this literature,
375 alternative research designs may help overcome this problem: for example, online
376 interventions can increase under-represented groups' access to services^{31,44-45}. Adequately
377 powered RCTs would be beneficial to evaluate whether these interventions are efficacious
378 among such sub-groups.

379

380 The results of this review are not sufficiently conclusive to make strong recommendations
381 for interventions that might be implemented in clinical settings. However, despite the
382 limited evidence for parental interventions, the literature is clear about the increasing
383 prevalence of allergies⁴⁶⁻⁴⁹ and the negative implications for affected individuals and their
384 caregivers⁵⁰. Although strong recommendations cannot currently be made regarding the
385 most efficacious intervention, clinicians must be aware of the growing needs of this
386 population and of the current evidence. There is increasing emphasis on the integration of
387 physical health and mental health provision⁵¹. With increasing understanding of the
388 interrelatedness of these sectors, policy-makers have reported that failing to address
389 individual needs in a holistic way results in worse outcomes that are socially and
390 economically costly⁵². This is reflected in the allergy literature; numerous studies have noted

the negative consequences for poorly supported parents that could be addressed by adequate provision of social, practical and psychological support^{4,53-55}.

In conclusion, the paucity of high-quality research evaluating interventions to support parents of children with food allergies is apparent. However, the studies summarised in this review suggest that future research should develop interventions that provide educational input to caregivers, which may influence their psychological wellbeing. Although limited, the evidence provides an indication that further support in the form of CBT could also offer mothers some benefits, but CBT has not been tested on other groups. However, the reviewed research suffers from methodological constraints which limit the validity of reported outcomes. Therefore, future research should use more methodologically sound designs and use validated outcome measures.

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Figure 1: PRISMA diagram of literature search¹⁶

Table 1 Online Repository: Summary of reviewed studies

First author (year); quality score	Population	Design	Study summary	Intervention type	Outcome measures	Results
Maurer et al. (2007)¹ MMAT: 50%	667 participants completed pre-test measures and 474 completed post-test measures. Participants were 58% female, 59% over-50, 83% white. The campaign ran in all counties across the state of New Jersey, USA.	Pre-test post- test	Authors created an educational campaign to better inform caregivers of food-allergic children and the general public of best practice food allergy management. The campaign was released and publicised in numerous media outlets including via newspapers, radio and in a PSA video that was shown across supermarkets and cinemas in the State.	Educational intervention for caregivers and the general public	An unvalidated 8-item criterion referenced knowledge test based on campaign materials. Reliability calculated as 0.77 (Livingston's coefficient) Acceptability was not assessed.	Authors contacted State residents randomly before and after the campaign broadcast. Post-test scores showed a statistically significant increase in knowledge scores, and authors concluded that the campaign was an effective way of providing information to caregivers in the general public.
LeBovidge et al. (2008)	61 food allergic- children and their parent(s) attended a	Pre-test post- test	Authors developed and implemented a group intervention to improve	Psychological group intervention for	- Medical information (ad-hoc questionnaire) - Family Coping with	Authors reported that higher levels of burden were associated with lower levels of

¹ Study reported development of educational materials, but these are not discussed in this review

MMAT: 25%	half day workshop. Participants were primarily white, female and university educated. The study was set in a hospital in Boston, USA.		perceived parental competence to manage food allergies.	parents	Food Allergy Questionnaire; 18 item measure developed by authors to assess perceived competence. Reported internal consistency ($\alpha = 0.91$). - FAQoL-PB; 17 item validated measure of QoL.	information in pre-workshop measures. Authors concluded that parental confidence improved significantly from preworkshop to postworkshop, and again at follow up. They also found a significant decrease in parental burden from preworkshop to follow up. Authors reported the intervention was acceptable for participants.
Stewart et al. (2011) MMAT: 50%	Participants were 19 parents of food allergic children (7-11 y/o) based in Canada. Most participants came from high income households, attended university	Qualitative study using a post-test evaluation	Researchers developed and evaluated the perceived usefulness and acceptability of an online allergy support group for parents of food-allergic children.	Supportive intervention, no psychological component	Outcomes gathered via individual semi-structured interviews, no formal outcome measures were used.	Participants reported that they benefitted from the support group, highlighting reduced feelings of social isolation, and the ability to ask sympathetic peers questions and gain advice as helpful.

(>90%) and lived in urban settings.

Baptist et al. (2012)	58 participants (47 at 3-month follow up) were recruited from an allergy clinic in Michigan, USA.	Pilot single blind RCT	Authors implemented a self-regulation intervention to improve food allergy related quality of life in parents of food-allergic children. The intervention group received phone calls from a trained clinician at 2 week intervals to discuss allergy management strategies.	Individual psychological intervention for parents	- FAQoL-PB; validated questionnaire to assess QoL - Unvalidated 8-item self-efficacy questionnaire developed by the authors. No reporting on reliability.	At 3 months, the intervention group had a statistically significant improvement in 4 domains (helplessness, anxiety, frustration and confidence in the FAQoL-PB questionnaire and on 1 item in the self-efficacy questionnaire. Did not report acceptability.
MMAT: 50%	Most participants were white, and from middle class households.					
Cochrane risk of bias: Some concerns/unclear risk of bias ²						
Sharma et al. (2012)	29/98 individuals affiliated with the institution in Pennsylvania, USA, and in attendance of the support groups completed an online survey.	Post-test questionnaire	Authors evaluated whether having a food allergy specialist present in support groups reduces parental anxiety and improves the relationship between parents and their allergy specialist.	Supportive intervention, no psychological component	Acceptability of intervention and anxiety related to caring for a food-allergic child was assessed in a 30-item unvalidated questionnaire designed	77% respondents reported a decrease in food allergy anxiety and most reported an improvement in their child's QoL. More than 90% reported that it was beneficial to have an allergy specialist present in support group meetings, and
MMAT: 0%						

² Cochrane risk of bias completed for only two studies which implemented a RCT design

	97% participants were female, 79% were university educated.				by the authors.	that this made it easier for them to discuss concerns with their own specialists.
Sicherer et al. (2012)	A convenience sample of 32 parents attending an allergy clinic were recruited to trial educational materials. Sample was selected from New York, USA.	Pre-test post-test	Authors aimed to explore the effectiveness of educational materials for parents of food-allergic children.	Educational intervention for parents	- Authors assessed participant knowledge and correct administration of auto-injector to assess effectiveness of educational materials. - Acceptability was assessed using a 4-point Likert scale satisfaction questionnaire developed by the authors.	Results demonstrated an improvement in technique for administering epinephrine pens, increased comfort with treatment, improvement in food allergy knowledge and overall satisfaction with educational materials. These benefits were maintained at follow-up 1 year later. Authors reported high acceptability and efficacy of the intervention.
MMAT: 25%						
Knibb & Semper (2013)	Participants were 124 parents attending an allergy	Pre-test post-test questionnaire	Study authors aimed to assess whether visiting an allergy clinic (for support and a diagnosis)	Educational intervention for parents	- Study specific demographic questionnaire to assess	Authors reported that 86.4% of parents reported suspected food allergy had an impact on

MMAT: 25%	clinic for diagnostic tests. 50 participants completed post-test measures 6 weeks later. The sample was drawn from an allergy clinic in the UK.		influences parental anxiety and depression. Measures were completed before and after the visit, and visit outcomes were also measured (i.e., if a food allergy diagnosis was given)		allergies, knowledge and acceptability of support offered at their allergy clinic. - The Hospital Anxiety and Depression scale (HADS) is a 14-item validated measure to assess anxiety and depression.	their family prior to attendance, 76% had made changes to their child's diet, 32.5% had mild to severe anxiety and 13.1% had mild to severe depression. However, researchers observed no changes in outcomes at follow up. Knowledge of food allergy significantly improved after clinic attendance.
	Participants were primarily female (80%), and white British (77.6%)					
Rosen et al. (2014)	Participants were 50 caregivers of food-allergic children.	Pre-test post-test questionnaire	Authors aimed to develop and validate audio-visual based food allergy educational materials for parents of food-allergic children.	Audi-visual educational intervention for parents	- Outcomes were assessed in a food-allergy knowledge questionnaire designed by authors. - Acceptability of the materials and interventions were assessed in a 7-point	Results identified an improvement in food allergy knowledge between pre and post knowledge scores, and high levels of satisfaction for the materials amongst participants (a mean score above 6).
MMAT: 50%	Individuals were recruited from an allergy clinic in NY, USA. Sample consisted of a white (66%), upper-					

income (82%
>80,000 per
annum), female
(76%) individuals.
Additionally, sample
was well educated,
with 90% of the
sample completing
undergraduate or
post graduate
university degrees.

Likert scale satisfaction
questionnaire designed
by study authors.

Knibb (2015)	Participants were 11 mothers (5 CBT intervention; 6 control), attending a local allergy clinic.	Non-randomised case control study	Evaluating the benefits of CBT to improve psychological outcomes for mothers of food-allergic children.	Psychological intervention for mothers	<ul style="list-style-type: none"> - 14-item HADS questionnaire to assess depression and anxiety. - Perceived Stress Scale (PSS), validated 14 item measure for stress. - FAQoL-PB to assess QoL. - WHO QoL scale- 26-item validated 	At baseline CBT group had significantly higher anxiety and depression, and poorer general mental health than the control group but these differences no longer existed following the intervention. The control group maintained significantly lower general mental health, and the intervention group demonstrated decreased depression, anxiety and worry
MMAT: 75%	All participants were white British and female.					

questionnaire. (with large effect sizes $r > 0.6$).
-Penn State Worry Authors concluded that CBT
questionnaire: 16-item seems to be an appropriate and
validated measure. effective intervention for
- General Health mothers.
Questionnaire; a
validated
questionnaire
assessing general
mental health

Polloni et al. (2015)	100 consecutive psychological treatments held at a food allergy referral centre were selected. 26% of these were family intervention, 9% individually for mothers and 2% individually for fathers. All treatments were	Post-test questionnaire design	Authors analysed the data for psychological treatments offered to individuals and their families attending a food allergy referral centre. They were interested in the reasons that individuals would access support from the service, and to identify the usefulness of psychological interventions to support this population. All interventions were grouped together (individual, parental, group	Psychological intervention for parents and families	Authors assessed effectiveness of psychological interventions using a measure with two questions, adapted from the Strengths and Difficulties questionnaire.	Authors reported that that requests for support were due to emotional/social problems (40%), difficulties managing food allergy (40%), eating problems (18%) and behavioural problems (2%). Authors indicated that participants reported that psychological interventions made them feel “a bit better” (67%) or “much better” (33%).
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conducted by a
psychologist. The
study was
conducted in Italy.

session, etc.)

No demographic
details were
reported.

**Wahl et al.
(2015)**

MMAT: 0%

4818 individuals at
247 schools and
community sites
based in Seattle,
Washington (USA)
participated. 15% of
the sample was
reported to consist
of parents,
volunteers, coaches
and food service
workers.

No demographic
details were

Post-test
design

Aimed to increase food allergy
knowledge and self-efficacy for
all caregivers of food-allergic
children through in-person
training.

Educational
intervention for
caregivers

Outcomes were
assessed with a
feedback
questionnaire asking
participants about
changes to knowledge
levels following the
intervention. No
formal, objective
knowledge
questionnaire was
administered.

Results identified that
respondents felt more
confident to manage food
allergies after their training,
and suggested that attendees
retained information about
food allergy management.
However, no baseline measures
were recorded to demonstrate
actual change.

reported.

Contreras-Porta et al. (2016)	174/184 participants completed both workshops and were recruited through social media websites. Sample were 56% mothers, 39% fathers and 4.9% caregivers. All were recruited in Spain.	Pre-test post-test study	Authors aimed to evaluate the provision of in-person educational workshops in improving QoL in food-allergic children and their parents	Educational intervention for parents	- Outcomes were measured using a 40-item knowledge questionnaire developed by the authors. - Acceptability of the intervention was assessed with a 5-point Likert scale satisfaction questionnaire designed by the authors.	Authors reported that 74/184 participants completed both workshops and were recruited through social media websites. Participants demonstrated improvements in food allergy management knowledge in 72.5% items on the knowledge questionnaire. Authors concluded that workshops were both acceptable and effective at improving food allergy management knowledge but they were unable to assess QoL due to lack of validated measures.
Danchin et al. (2016)	Participants were 10-12 paediatricians in Victoria, Australia. They opted in to the	Pre-test post-test study	Study aimed to provide GPs with training to better diagnose and manage food allergies, and that this would improve child QoL and parental mental health in	Supportive intervention, no psychological component	- Outcomes for paediatricians were assessed using the Chicago Food Allergy Research Survey.	Clinicians reported improved competency in managing food allergy their food allergy knowledge increased by 69-75%.
MMAT: 50%						
	No other demographic details were reported.					
MMAT: 25%						

	study and had no previous training in allergy management. Participants also included allergy patients (n=32) belonging to allocated clinicians who were taken from the clinic waiting lists.		parents of children with mild-moderate allergy presentations who might wait longer to access specialist appointments.		- Parents completed validated measures including the Depression Anxiety Stress Scales 21 (DASS), FAQoL-PB, PeDQL Family impact scale. - Satisfaction measured in a follow-up questionnaire designed by study authors.	82% families returned baseline surveys and 92% were satisfied with the care they received. Authors reported that parental mental health improved, (particularly anxiety) but that gains were small and this result was not significant. Mean scores for parental stress were below clinical cut-off in both timepoints.
Boyle et al. (2017)	Participants were 200 mothers, recruited from allergy clinics in London, UK.	RCT	Authors aimed to examine whether a brief single session of CBT would help reduce maternal state anxiety	Psychological intervention for mothers	- The following outcome measures were used: Stait Trait Anxiety Inventory Scale (STAI), PSS, Strengths and Difficulties Questionnaire (SDQ), Screen for Child Anxiety Related Emotional Disorders (SCARED), Food Allergy	Authors reported that there was no difference in state anxiety between intervention and control group 6 weeks, except for a subgroup that started with moderate/high levels of anxiety at Time 1 (with a moderate effect size $r = 0.5$). Authors also found that the intervention educed risk perception and salivary cortisol
MMAT: 100%	All participants were female, 53% participants had a university degree and 59% were non-white.					
Cochrane risk of bias: Low risk of bias						

					Impact Scale (FAIS), Food Allergy Quality of Life Questionnaire.	response (however with a low effect size). In conclusion, authors identified that a brief intervention that incorporates risk perception may have an effect on parental anxiety for those reporting higher levels of distress.
Ruiz-Baques et al. (2018)	Participants were 135 carers and parents (75.4% mothers, 14.6% fathers, 10% caregivers) of food allergic children. Individuals were recruited online via social media websites, and the study was conducted in Spain.	Pre-test post-test questionnaire	Authors aimed to identify whether a 2-week online educational programme could improve QoL in parents of food-allergic children.	Educational intervention for parents	- Outcomes were measured using an ad-hoc 40-item knowledge questionnaire designed by the authors. - Acceptability of the intervention was assessed with a 5-point Likert satisfaction questionnaire.	Authors reported improvements on 15/30 items on their knowledge test, and there was a significant improvement in 8 items. Engagement in the programme was good, with 76.2% participants visiting the website up to 25 times and 23.8% more than 26 times in 2 weeks. Slightly lower attendance for live streams (27.5%, 18.3% and 15.9%). Authors reported a high level of satisfaction with the programme.
MMAT: 50%						