

What is the prevalence of visual hallucinations in a first-episode psychosis population? A systematic review and meta-analysis of the literature

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Title: What is the prevalence of visual hallucinations in a first-episode psychosis population? A systematic review and meta-analysis of the literature

Running Title: Prevalence of visual hallucinations in psychosis

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Abstract

Background & Hypothesis: This systematic review and meta-analysis reviews the literature regarding the prevalence of visual hallucinations in patients with a first-episode psychosis. Previous reviews have focused on the prevalence of visual hallucinations in a general psychosis population, highlighting a weighted prevalence of 27%¹. However, no reviews have focused specifically on the experiences of those with a first-episode of psychosis. Understanding ‘first-episode’ experiences is crucial, as intervention during this ‘critical period’ is thought to define long-term outcome.² Therefore, it is important that the prevalence of different symptoms during this period is accurately represented.

Study Design: Systematic searches yielded 15 studies to be meta-analysed. Information to calculate event rates was extracted. Studies were rated for their methodological quality using a risk of bias tool. The quality of included studies varied; generalisability bias was the domain with the most risk of bias.

Study Results: Prevalence rates were synthesised from the 15 papers included in the final analysis, which generated a weighted prevalence estimate of 33% of people with first-episode psychosis experiencing visual hallucinations. Subgroup analyses were carried out and did not demonstrate significant associations.

Conclusion: This meta-analysis provides a robust estimate of 33% for the prevalence of visual hallucinations in first-episode psychosis; highlighting that visual hallucinations are relatively common experiences.

What is the prevalence of visual hallucinations in a first-episode psychosis population?

A systematic review and meta-analysis of the literature

Psychosis is defined by core clinical features, such as hallucinations, delusions and thought disorder and accompanied by a lack of insight, communication disorders and reduced social functioning.³ Psychosis is experienced across a broad spectrum of diagnoses, such as schizophrenia, schizo-affective disorder and bipolar disorder. To support service delivery, understanding the prevalence of differing symptoms at different stages of psychosis is crucial. Whilst visual hallucinations are among the most prevalent symptoms of psychosis¹ they have often been neglected in comparison to auditory hallucinations. Here, we review research on visual hallucinations in “first episode” psychosis.

First Episode Psychosis

Definitions of ‘first-episode’ psychosis vary, but typically refer to “people early in the course of a psychotic illness or treatment, rather than people who are truly in the midst of a first ‘episode’ of illness.”⁴ Understanding “first-episode” experiences is crucial, as intervention at this stage is thought to define long-term outcome.^{2,5} The recognition of the processes involved in a first-episode of psychosis has led to the development of specialist early intervention services designed to reduce treatment delay and increase access to evidence-based interventions.⁶ This early-intervention paradigm is partially predicated on the basis of the ‘critical period hypothesis’,⁷ which argues that the early phase of psychosis (the first two – five years) is a critical period in which biopsychosocial influences are at their most malleable and dynamic. In addition to psychotic symptoms, people are affected by the biological changes and

the social impact of the onset of the disorder, such as the effect on social relationships and employment.^{8, 9, 10} Intervening during this phase is crucial and has been shown to improve understanding of symptom dimensions.¹¹

Visual Hallucinations

Hallucinations are common symptoms of psychiatric disorders and can cause significant distress and dysfunction.¹² Diagnostic manuals such as the DSM-V³ highlight hallucinations as a primary symptom in psychotic disorders, however, within this category, auditory hallucinations tend to be more commonly explored.¹³ Visual hallucinations are often overlooked, which may be due to traditional beliefs that these phenomena are related to organic disorders.¹ It may also be due to the difficulty in identifying particular criteria for the presence of visual hallucinations when other perceptual abnormalities may be reported.¹

Visual hallucinations are defined as visual percepts, experienced when awake, in the absence of an external stimulus.¹⁴ They are experienced by patients with conditions that span several fields such as neurological, psychiatric and eye diseases, as well as non-clinical populations.¹⁵ Visual hallucinations have been reported in 16%–72% of patients with psychotic disorders.¹⁶ They are often distressing, involving figures, people and animals,¹⁷ can have a greater impact on a person's social functioning and relationships compared to auditory hallucinations, and are associated with an increased likelihood of intensive support and/or care via hospital services.¹⁸ Previous reviews have focused on the prevalence and experiences of visual hallucinations in a general psychosis population, with a recent review highlighting a weighted prevalence of 27%.¹ However, no reviews have focused specifically on the experiences of those with a first-episode of psychosis.¹⁸

Visual Hallucinations in First Episode Psychosis

While much is known about the aetiology, risk factors, treatment and outcomes for people with first episode psychosis,¹⁹ evidence on prevalence rates and phenomenology of symptoms in the first-episode population is less clear. The limited literature has led researchers to question whether the phenomenology in the young first-episode patient differs from those with a more established illness.²⁰ The studies that have explored visual hallucinations in first-episode psychosis have highlighted the need for further investigation to support ‘preventative action and symptom management’.¹² Clark et al. (2017) suggested that visual hallucinations in first-episode psychosis were indicative of a course characterised by reduced functioning. In the first few years of illness onset, the presence of visual hallucinations was associated with greater disability, risk of relapse, and duration of psychosis in the past year, and consistent with prominent residual psychotic symptoms.¹² These findings are in line with studies showing a link between visual hallucinations and greater global illness severity²¹ and anxiety levels.²² Despite these results, research focusing on visual hallucinations remains relatively scarce²³ and inconsistent,²¹ highlighting the need for a synthesis of current research.

Estimates of prevalence rates of visual hallucinations in first-episode psychosis have varied hugely, with some studies putting these as low as one in eight²⁵ and others finding that most patients with first-episode psychosis experience visual hallucinations.²⁶ Given the importance of the first-episode of psychosis for treatment outcomes, it is crucial that the prevalence of different symptoms during this period, and how they are experienced by people with first-episode psychosis, are accurately represented. Calculating a pooled estimate of prevalence of visual hallucinations in first-episode of psychosis is crucial to understand how common this experience is; this can normalise service users’ experiences and enhance clinicians’

understanding of such phenomena. Further, it is important to understand the factors that may have contributed to such disparate estimates.

Rationale

Prevalence rates of visual hallucinations have been identified in broad psychosis populations, with a weighted prevalence of 27%.¹ Whilst research into these experiences has increased over recent years, it has produced widely varying estimates of prevalence and has focussed specifically on more severe or chronic psychosis presentations. The rate at which these symptoms are present during the ‘critical period’ of psychosis is not well-documented. Having a greater understanding of the characteristics of this sample may support future exploration in both research and clinical practice to support the development of more meaningful assessments.

Therefore, the present systematic review and meta-analysis aims:

- i. To synthesise existing literature and calculate pooled prevalence estimates for rates of visual hallucinations in first-episode psychosis populations
- ii. To assess how the rate of visual hallucinations in first-episode psychosis populations has changed over time
- iii. To evaluate the impact of different factors, such as assessment measures, service context and participant characteristics on the rates of visual hallucinations in first episode psychosis populations.

Method

Search Strategy

A systematic search of the literature was carried out in December 2021. The search terms were guided by those used in previous reviews on related topics.^{1,27,28} The databases PsycINFO, Embase, Medline and Web of Science (1967 – December 2021) were used to search the literature using the terms in table 1. Search terms for visual hallucinations and first-episode psychosis were then combined using the ‘and’ function and all papers exported to be searched. The keywords were searched for anywhere in the text.

Table 1 Search terms used for the systematic literature review

Construct	Search strategy number	Search Terms	Combined	Combined
First-episode psychosis (population)	1	“first-episode” “first-episode psychosis” “first-episode schizophrenia” “early schizophrenia” “early psychosis” “recent onset” “Early Intervention Services” “EIS”	OR	

		AND	
Visual	2	“visual hallucinations”	
Hallucinations		“non-auditory hallucinations”	
(outcome)		“VH”	
		“visions”	
		“visual perceptions”	OR
		“visual perceptual abnormalities”	
		“perceptual abnormalities”	
		“visual disturbances”	

Paper Selection

The full search strategy, using Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines, is described in Figure 1. Titles and abstracts were screened by inclusion and exclusion criteria (supplementary materials - Table 1) and removed if they met any exclusion criteria or did not meet all inclusion criteria. If this could not be determined from title and abstract, the full paper was screened. Prevalence was too broad a construct to be usefully included in the search terms. Therefore, the reporting of prevalence was hand-searched in the full text of the articles after the title screen had been completed.

Data Extraction

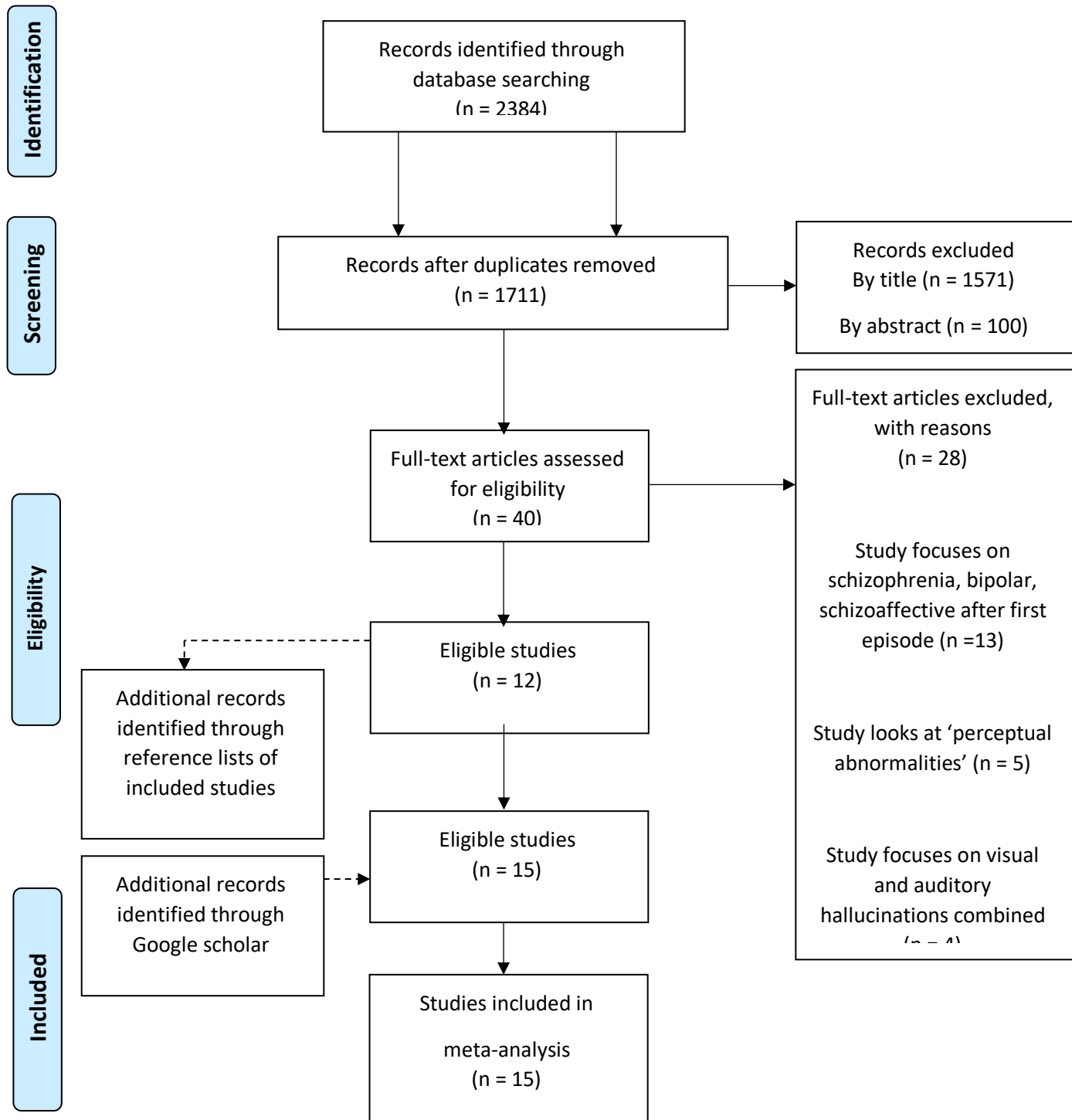
Data extracted from each paper included demographic information, broad study characteristics and information on the reported rates of visual hallucinations. Where necessary, authors were contacted and asked to provide missing data. All data were extracted by the author and the

reliability of data extraction was cross validated by a second rater with no errors or discrepancies noted.

Quality Review

A Quality Assessment Framework (supplementary materials - Table 2) was developed based on The Cochrane Collaboration Risk of Bias Tool²⁹ and an appraisal tool tailored specifically for the evaluation of studies estimating rates of prevalence.³⁰ This was designed to measure the methodological limitations of a study in relation to the goals of the meta-analysis and assessed risk of bias across six domains: selection bias, performance bias, detection bias, statistical bias, reporting bias, and generalisability. Each study was given the rating low, medium or high risk.

Figure 1. Study selection: Adapted PRISMA flow diagram (Moher et al., 2009)



Results

The search identified 2384 articles, which was reduced to 1711 once duplicates were removed. These articles were then screened by title which excluded 1571 studies and then by abstract which excluded a further 100. Reasons for exclusion at this stage were: studies whose participants did not meet the criteria for a first-episode of psychosis (e.g. neurodegenerative disorders, chronic schizophrenia diagnoses) and review articles not reporting novel empirical data. The remaining 40 articles were screened in detail, and 12 studies were eligible for this review. The reference lists of these 12 articles and of relevant reviews were screened, where two more articles were identified; these two articles were conducted prior to the databases publication date (before 1967). For completeness, a google scholar search was also undertaken, where one further article was identified²⁰; this article included adolescents and young people up to the age of 25 years old, and therefore used keywords that were not included in this review's original search terms. Another search was conducted using the search terms "adolescent" and "young people" and it did not return any further relevant articles. In total, 15 studies were eligible for the meta-analysis.

Prevalence rates were synthesised, and random and fixed effects models were generated based on the 15 papers included. Subgroup analysis was conducted to assess levels of heterogeneity between studies; the impact of study-level risk of bias; the impact of measures frequently used to identify visual hallucinations and the impact of service context. A meta-regression was conducted to evaluate how participant characteristics, such as age and sex, impacted overall prevalence estimates; as well as assessing how the rate of visual hallucinations has changed over time.

Study Quality

The quality framework yielded a high quality of studies overall (Table 2). The majority of studies reported both low and medium risk of bias. Twelve of the studies did not report high risk of bias in any domains and one study did not report low risk for any of the domains³². However, for three studies there was high risk in the three domains of: detection, statistical and reporting bias, questioning the validity of the study designs to accurately measure the specific event rate. The one domain that had the majority of medium risk of bias ratings was that of generalisability. This could reflect the specific nature of the population being studied and the difficulty in generalising the specific symptomology to the wider psychosis population. The included studies are representative of the research literature in this area at the time of writing and therefore are included despite high and medium risks of bias.

Table 2 *Quality Framework Results*

Study	Study Design	Selection bias	Performance bias	Detection bias	Statistical bias	Reporting bias	Generalisability bias	Quality Index
Aynsworth (2017) ³³	PCS	Green	Green	Green	Yellow	Yellow	Yellow	75%
Caton (2005) ³⁴	PCS	Green	Yellow	Yellow	Green	Green	Yellow	75%
Chapman (1966) ³⁵	PCS	Green	Green	Red	Red	Yellow	Yellow	50%
Clark et al (2017) ¹²	PCS	Green	Yellow	Yellow	Green	Green	Green	83%
Dudley et al (2013) ¹⁸	PCS	Yellow	Green	Yellow	Yellow	Green	Yellow	66%
Dudley et al (2019) ²⁵	PCS	Green	Green	Green	Yellow	Green	Green	91%
Galetti et al (2017) ²⁴	RCS	Green	Yellow	Green	Green	Yellow	Yellow	75%
Goghari & Harrow (2016) ³⁶	RCS	Green	Yellow	Green	Green	Green	Green	91%
Jablensky et al (1992) ³⁷	RCS	Green	Green	Green	Green	Green	Green	100%
Longden et al (2016) ²⁶	PCS	Green	Yellow	Yellow	Yellow	Green	Yellow	83%
McKetin et al (2018) ³²	PCS	Yellow	Yellow	Yellow	Yellow	Red	Yellow	41%
Norman et al (2005) ³⁸	PCS	Green	Green	Green	Green	Yellow	Yellow	83%
Rajapakse et al (2011) ²⁰	RCS	Green	Yellow	Yellow	Green	Green	Yellow	75%
Solesvik et al (2016) ³⁹	PCS	Yellow	Green	Green	Green	Green	Green	91%
Young (1974) ⁴⁰	PCS	Green	Green	Red	Red	Yellow	Yellow	50%

Note: Retrospective Case Cohort Study (RCS) & Prospective Case Cohort Study (PCS)

Meta Analysis

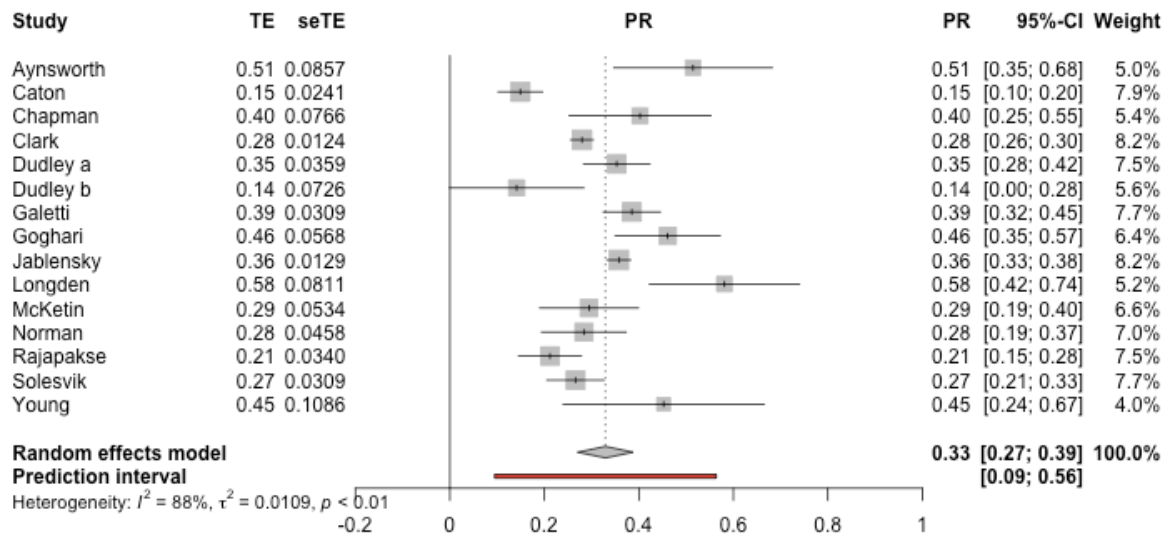
Fixed effect and random effects models

There was clear evidence of non-linearity in the distribution of prevalence rates within the primary studies when using the fixed effects model, however there was no evidence of non-linearity when using the random effects model (supplementary materials – figure 1). Therefore, the summary effect size and 95% confidence intervals (CI) were calculated using the random effects (RE) model. The RE model accounts for variation between studies as a result of idiosyncrasies in the methodologies of the primary studies, as is commonly seen in psychological research⁴¹. The Restricted Maximum Likelihood estimator⁴² was used as the appropriate method for the calculation of the variation of the true effect. This estimator has been shown to be more robust to deviations from normality⁴².

The Omnibus Test

The aim of this review was to synthesise existing literature and calculate the pooled prevalence estimates for rates of visual hallucinations in a first-episode of psychosis population. Psychosis affects 0.7% of the population and a recent review reported that the weighted prevalence of visual hallucinations in a general psychosis population as 27%. In comparison, the random-effects model in this review generated a weighted prevalence estimate of 33% of people with first-episode Psychosis experiencing visual hallucinations (figure 2; $z = 10.92$, $p = <.0001$; 95% CI: 27.01-38.83%).

Figure 2. Forest plot of prevalence rates



Note: TE - the effect used for the meta-analysis; SeTE - standard error of the effect; PR - prevalence rate.

Heterogeneity

A high level of heterogeneity in the primary studies was observed (Higgins $I^2 = 87.7\%$, $\tau^2 = 0.0109$, $p < 0.01$). This finding prompted further examination of the factors that may account for the high levels of inconsistency in the reporting of prevalence in the primary studies.

Impact of Influential Studies

The impact of disproportionately influential studies was assessed using a “leave-one-out” analysis, in which the random effects model was calculated with each of the primary studies removed in turn and change in weighted average effect size (i.e., influence) and the change in heterogeneity (i.e., discrepancy) was recorded. Two studies were found to be discrepant from the remaining literature and influential upon the overall synthesis. The random effects model was recalculated with the removal of the two studies showing disproportionate influence. The

corrected random effects model reported a synthesis of prevalence = 0.3269 (95% CI 0.28 to 0.37). The corrected random effects model evidenced a <1% decrease relative to the uncorrected estimate, reporting a non-substantive effect. The studies were re-reviewed to identify any factors that might indicate that they should be removed from the analysis. As no risk of bias factors could be identified within these studies that may account for their substantial discrepancy from the rest of the literature, they were not removed from subsequent analysis.

Subgroup Analyses

To understand the relationship between the findings and the methodological heterogeneity, subgroup analyses were conducted.

The Impact of Symptom Measures

To quantify the impact on prevalence rate of how VH are measured, a subgroup analysis was undertaken to compare the three different types of measures (psychotic symptoms measure; visual hallucination measure; self-report). The estimate of prevalence for the psychotic symptom measure was PR = 0.31 (95% CI; 0.24 – 0.37) as compared to the estimates of prevalence for the self-report which was PR = 0.40 (95% CI; 0.23- 0.56) and visual hallucination measure which was PR = 0.33 (95% CI; 0.13 – 0.53). The difference between the three types of symptom measure was not statistically significant ($X^2=1.11$, $p=0.57$).

The impact of service context

As highlighted in the study characteristics, studies were conducted in different service settings. A subgroup analysis was undertaken to compare the two different types of services (a first-

episode psychosis specific service, such as Early Intervention services vs. community services). The estimate of prevalence for the community service was 0.33 (95% CI; 0.24 – 0.41) as compared to the estimates of prevalence for first-episode of psychosis specific service which was PR = 0.33 (95% CI; 0.24 - 0.42). The difference between the two types of service context was not statistically significant ($X^2=0.01$, $p=0.92$)

The Impact of Year of Publication Date

Visual hallucinations have been under-reviewed in the psychosis literature and it is thought that more recently we have developed a better understanding of such phenomena. To estimate whether the prevalence has changed overtime, the year of publication of the study was regressed to the treatment outcome using meta regression. The association between year of publication and prevalence rates did not show statistical significance ($(\beta = -0.0009, z=-0.64, p = 0.52)$).

The Impact of Age & Sex

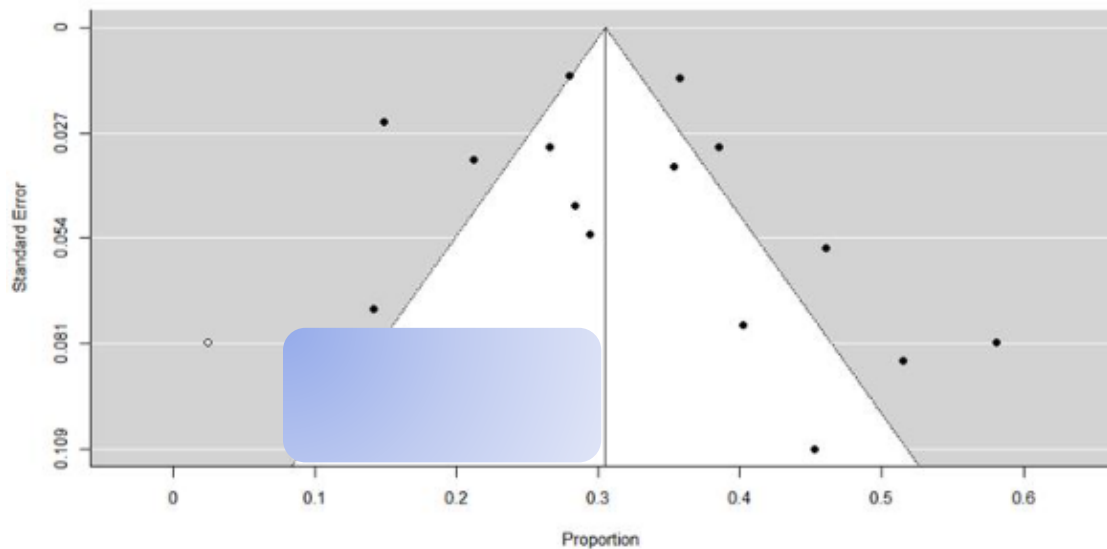
To further calculate the impact of age and sex upon prevalence rates over time, the mean age and sex (proportion of males) of participants reported in each study was regressed to the weighted prevalence using meta regression. The association between mean age of participants and prevalence rates ($\beta = -0.0088, z=-0.8813, p= 0.4$) did not show statistical significance. The association between proportion of males in each study and prevalence rates ($\beta = 0.0432, z=0.147, p= 0.884$) also did not show statistical significance.

The Impact of Publication and Small Study Biases

Analysis highlighted possible evidence of publication bias in the distribution of prevalence (Figure 3). The effect of publication bias was simulated using a trim and fill procedure⁴³. The

trim and fill procedure yielded a corrected random effects model of prevalence = 0.305 (95% CI 0.2399 to 0.3701). The corrected random effects model evidenced an approximately -7.3584 % decrease relative to the uncorrected estimate. Accordingly, the correction for publication did not result in a significant change in the meta-analytic synthesis and did not change the substantive conclusions from this analysis.

Figure 3. *Funnel plot of the prevalence rates*



Note: The 95% confidence interval of the expected distribution of prevalence is shown as an inverted “funnel”. The area in blue is that associated with null or small effects in small sample sizes. The white dots are imputed by the trim and fill procedure.

Discussion

The prevalence of visual hallucinations in a first-episode psychosis population was systematically reviewed and meta-analysed. This was the first study to meta-analyse data specific to these symptoms and population. The use of a robust and standardised search strategy improved the accuracy of estimates, with strict inclusion and exclusion criteria enhancing the

internal validity of findings. Overall, visual hallucinations were estimated to have a prevalence rate of 33% amongst people experiencing their first-episode of psychosis. This is significantly higher than the general population estimate (21.5%)⁴⁴ and marginally higher than rates of visual hallucinations in a psychosis spectrum population as reported in a recent meta-analysis (27%)¹. The subgroup analyses within this review did not demonstrate significant associations between prevalence rates and the assessment tools used; the impact of service context; publication date of reviewed studies or participant characteristics. The results discussed here have clinical implications for people experiencing their first-episode of psychosis and how such symptoms are understood and managed.

Experience of Visual Hallucinations

Hypotheses have been explored that may explain the higher rate of visual hallucinations in first-episode psychosis versus the broader psychosis spectrum, compared to other reported symptoms such as auditory hallucinations, where prevalence rates appear to remain consistent across illness trajectory (60-80%)¹. The occurrence of auditory hallucinations is linked to one's inner speech and is the result of the internalisation of external dialogues during psychological development^{1,45,46}. Auditory and visual hallucinations are experienced across the lifespan; different disorders; and clinical and non-clinical populations^{27, 28, 44}; highlighting that they are not diagnostic of just psychosis and appear to have less prognostic value when compared to other symptomatology such as negative symptoms¹². However, visual hallucinations may be experienced as external to oneself and therefore more distressing⁴⁷ – with this in mind, they may be more likely to be reported at high rates during the early phase of psychosis.

People may appraise the experience of visual hallucinations as a threat to their physical or psychological wellbeing⁴⁸. Therefore, the distressing nature of seeing an image external to

oneself and interpreting this as a threat may result in more reporting and higher rates of prevalence in the first-episode population, than the general psychosis population, who may be more accustomed to these experiences^{49,50}.

Psychosis is a highly stigmatised disorder; therefore, it is understandable that people may fear that their diagnosis will impact how others relate to them⁵¹. However, studies measuring perceived and experienced stigma in first-episode psychosis samples report lower rates of experienced stigma ranging from 6%–43% compared to the broader population; this suggests that experienced stigma may increase with duration of illness⁵². This may explain the higher rates of prevalence of visual hallucinations in first-episode, as people feel more able to report their distressing symptoms during this phase of their illness, before levels of perceived stigma increase. Birchwood et al. (2006) emphasised that once a person has experienced an episode they are then vulnerable to feeling devalued because they may feel they belong to the stigmatised group. Subsequently, they may fear others seeing and judging them through the lens of the stigmatising stereotype and may believe that rejection is never far away⁵³. Given that rates of visual hallucinations decline across the course of the illness, this suggests that these experiences, which are seen as external to one's self, may be particularly stigmatising. This, plus the potentially more threatening experience of the visual hallucinations in comparison to other symptomology, suggests they may be particularly prone to low reporting in the later course of psychotic illnesses.

The marginally higher prevalence rate could be due to symptom treatability due to the specialist early intervention approach. The aim of which is to provide a variety of treatment, from pharmacological to psychological and social interventions⁵⁴. In doing so, services are supporting people to improve poor engagement, loss of role and social contacts, perceived

stigma and shame, anxiety and depression, and enhance feelings of safety and care⁵⁵. This intensive support may have a positive impact on the person's trust and relationship with the specialist service, enabling them to report their symptoms and therefore distancing themselves from stressors that might be associated with longer-term effects, such as stigma and shame⁵⁶; which could explain the reduction in prevalence rates following this critical period. If symptom treatability is key, this suggests perhaps that early intervention approaches are more successful in precipitating a decline in visual hallucinations in comparison to other psychotic symptoms.

The initial years of illness onset are typically the worst symptomatic period in the course of psychosis, suggesting that in the later course of the illness, rates of visual hallucinations decrease to similar levels as found in other types of psychotic disorders³⁶. In support of this, Dudley et al. (2019) found that visual hallucinations may be transitory for many early intervention service users, which could explain the lower prevalence rates following transition from first-episode psychosis to the broader population.

It is evident from the various arguments identified that there is not a clear evidence base for why visual hallucinations seem to occur more frequently in first-episode psychosis, which highlights the need for further exploration of such phenomena⁵⁷. It is also important to acknowledge that the specific mechanisms of visual hallucinations are not known with a variety of literature highlighting various theoretical understandings of these symptoms^{46,58}. As Dudley et al (2023) acknowledge, the high prevalence, and associated distress of auditory hallucinations has contributed to the comparatively limited research into experiences occurring in other sensory modalities. Due to this, it could be argued that hallucinations in other modalities have been overlooked in clinical practice^{12,46}. Research has highlighted that exploration of such experiences is often reliant on self-report or has been gathered

retrospectively meaning that the true nature of these experiences has been neglected⁵⁸. Therefore, it has been recommended by various researchers^{49, 59} that the exploration of hallucinatory experiences is conducted by trained interviewers who show an understanding of the mechanisms, such as clinicians within early intervention services⁶⁰. Interest in the range of hallucinatory experience is increasing as the prevalence, nature, causes and impact of hallucinations across sensory modalities remains unknown⁵⁷.

Heterogeneity and Subgroup Analyses

High levels of heterogeneity were identified ($I^2 = 87.7\%$). Several possible reasons for this were examined statistically. Analysis on the methodological quality of the studies found no significant differences in estimates of prevalence. Subgroup analyses showed no significant differences between groups based on method of measurement of visual hallucinations or service context. Given the relative lack of research specifically on visual hallucinations, they are often assessed using a general symptom measure³³. These measures tend to demonstrate poor levels of adequacy with regards to criteria specific to assessing visual hallucinations however, the results from this review suggest that the type of measure used does not affect prevalence estimates.

A further possible reason for the high heterogeneity could be difficulty in defining first-episode psychosis and therefore, the variability in populations studied. Clearly defining the term 'first-episode psychosis' has proved difficult within practice⁴. Whilst samples continuously use differing definitions, the ability to assess these groups robustly decreases. This lack of clarity with regards to defining first-episode could support the non-significant results of service context on prevalence of visual hallucinations. The slightly higher prevalence rate of visual hallucinations in first episode compared to general psychosis populations may be because first-

episode groups are not subject to the potential stigma that may arise throughout the duration of a psychotic episode; this may also be true of the views and decisions held in regards to medication compliance and illness severity by clinicians⁶¹. Therefore, this population may be more representative of the true experience of psychotic phenomena, resulting in higher reporting of these symptoms⁶². However, it is important to note that there is limited research into stigma in the early stages of an evolving psychotic disorder⁶³ and further exploration is required.

Meta-Regression Analyses

The influence of participant characteristics on prevalence estimates was assessed via a meta-regression; no significant associations were found. Men usually develop the illness at age 18–25, while in women, the mean age of onset is 25–35⁶⁴. These statistics align with the reviewed studies, where the majority of participants were male with a mean age of 24.7 years. Due to the proportion of males to females reported, meta-regression is a limited way in which to measure these effects. The non-significant results in this review suggest that men and women experience similar prevalence rates of visual hallucinations despite age of illness onset.

A meta-regression was conducted to assess whether publication date impacted upon prevalence estimates, with no significant associations found. The historic focus of the psychosis literature on auditory hallucinations as core diagnostic characteristics overshadowed research on other modalities, with early interest in models of visual hallucinations in psychosis lapsing for a while¹⁶. This may have been due to the more frequent occurrence of auditory hallucinations, with the rise in pharmacological use therefore making them seemingly more receptive to treatment²¹.

It is important to note that all of the studies included in this review were conducted in the Western world, therefore providing a particular viewpoint on psychosis and its associated symptoms. Unfortunately, there was not sufficient data available to compare cultural or ethnic group differences across studies. Cross-cultural studies have reported a higher rate of visual hallucinations in non-Western cultures³⁷, and have suggested that this is due to the influence of culture on the expression of symptoms²¹. More recent research has highlighted cultural differences in attribution and reporting of symptoms and help-seeking⁶⁵; all of which could impact upon prevalence estimates within this specific population.

Limitations

The majority of the studies did not have a particular focus on visual hallucinations and a number of them used adapted auditory hallucination assessment measures and interventions to explore symptoms, suggesting that they are experienced in similar ways⁶⁶. The small number of studies in the review supports the view that visual hallucinations can often get overlooked in clinical practice, therefore, data collected with the specific purpose of investigating visual hallucinations might have provided more in-depth information³⁹.

Future Research and Clinical Implications

This review has highlighted that visual hallucinations are highly prevalent and more common in a first-episode population; therefore, it is important for clinicians to routinely ask about the presence of visual hallucinations to aid this process of assessment and to help normalise these experiences which can cause distress and suffering¹⁸. Further exploration of the phenomenological aspects of visual hallucinations, such as the role of stigma and shame in the

onset and maintenance of such phenomena⁴⁹ as well as the particular mechanisms of psychological and psychiatric interventions is required to understand the difference in prevalence rates during and following the first-episode of psychosis³⁶. In addition to this, adaptations of auditory hallucination measures and interventions are not sufficient to explore the true experience of visual hallucinations, therefore resources specific to these symptoms is required⁶⁷.

Conclusion

This meta-analysis provides a robust estimate of 33% for the prevalence of visual hallucinations in first-episode psychosis. Sub-group analysis revealed no significant associations between prevalence rates and service context; participant characteristics; publication date and assessment methods, suggesting that further, more detailed exploration is required. This review has highlighted that visual hallucinations are relatively common experiences and the reporting of these may not be representative of the person's experience of them. Future research and clinical pathways should explore ways in which specific support is offered to those experiencing their first-episode of psychosis in the identification of symptoms such as visual hallucinations and investigate how best to offer this support, to ensure a positive recovery outcome.

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