

# Analysis of patient variables including socioeconomic indicators and their association with recurrence rates and persistence of benign paroxysmal positional vertigo: A retrospective case series

## 1 | INTRODUCTION

Benign Paroxysmal Positional Vertigo (BPPV) is a peripheral vestibular disorder presenting with momentary periods of vertigo on changes of position of the sufferer's head. It is the commonest cause of peripheral vertigo, with an estimated lifetime prevalence of 2.4%.<sup>1</sup> BPPV is also one of the most treatable causes of vertigo, with the mainstay of treatment being repositioning movements.<sup>2</sup>

Previous research has shown that BPPV is more common in certain demographics. In particular, BPPV tends to be not only more common in older age groups, but also elderly tend to have more episodes of BPPV.<sup>3</sup> Although BPPV is often easily treatable, some patients suffer from persistent BPPV which is refractory to repositioning manoeuvres.<sup>4</sup> Patients can also have recurrence of BPPV, with some studies finding up to 26% patients will have a recurrence of their BPPV after initially successful repositioning movements. Overall, given its high prevalence, BPPV can significantly affect, at least temporarily, the performance status and the quality of life of the affected individuals and can present significant burden to every health system.

Considering how common BPPV is, there are mostly sporadic systematic efforts to investigate the reasons behind recurrences as well as persistent BPPV. Indeed, there are few studies which have attempted to look for socioeconomic risk factors for BPPV, and even fewer which look specifically at persistence and recurrence of BPPV.

The aims of our study were:

1. To identify any relationships between patient variables with persistent or recurrent vertigo.
2. To identify determine any statistically significant relationship between socioeconomic circumstances and rates of recurrent or persistent BPPV.

## 2 | MATERIALS AND METHODS

### 2.1 | Basic settings and patient selection

We performed a retrospective case series in academic settings. This study was approved as audit by the Research Ethical Committee. Local Caldicott guardian approval was gained for this study.

We analysed the notes of patients presenting to an audiology-led vertigo clinics in a secondary care service covering 1.2 million population and tertiary referral service covering 2.2 million population who were diagnosed and subsequently treated for BPPV. We covered the 3-year time period between end 2018 and beginning 2021. Patients that were re-presentations were also included and data from previous visits were collected to ensure accuracy of captured data with detailed documentation of the precise number of presentations and treatment sessions.

We included only patients with a confirmed diagnosis of BPPV, that is, clear documentation of symptoms consistent with BPPV as well as a positive Dix-Hallpike manoeuvre or supine log roll test. A positive Dix-Hallpike manoeuvre was defined as objective nystagmus (observed with naked eye or with video-Frenzel goggles) and/or subjective vertigo.

### 2.2 | Collected data

We primarily collected data on whether the patient had persistent or recurrent BPPV.

Persistent BPPV was defined as representing within 9 weeks of a previous session with ongoing BPPV.

Recurrent BPPV was defined as:

- any episode happening more than 9 weeks after the previous session.
- if the patient had a documented complete resolution of their BPPV symptoms but represented with symptom recurrence.

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Resolution was defined as the patient having no subjective vertigo and no nystagmus on Dix-Hallpike test. Dizziness handicap inventory scores were not routinely collected in the department and so this data was not collected.

Data collected in this study included patient demographics (age, age group and gender), side of BPPV, whether the patient had a vestibular co-morbidity (such as previous vestibular neuronitis or Meniere's disease) and number of total visits; we also recorded the presence of anxiety/depression, hypertension, ischaemic heart disease (IHD) and Diabetes Mellitus (DM) as a medical diagnosis. This data was collected from original referral letters and other clinical documentation, based on expert clinical reviews. Age was grouped into decades.

In order to assess the impact of socioeconomic factors on recurrent/persistent BPPV, we used the Scottish Index of Multiple Deprivation (SIMD), a measure of deprivation across 6976 small areas in Scotland.<sup>5</sup> It is based on seven domains: income, education, employment, health, housing, crime and access to services. Postcode areas in Scotland are scored and ranked from 1 (most deprived) to 6976 (least deprived). This index allows for a score of an individual's deprivation to be calculated and used for analysis.

## 2.3 | Analysis

Data were recorded on excel spreadsheets. We utilised RStudio to carry out our statistical analysis. We used Spearman's rank correlation to assess for any correlation between variables. The statistical significance level was set at 0.05.

## 3 | RESULTS

We identified 138 patients with definite BPPV as the sole cause of their symptoms (Table 1). The mean age of the patients was 64 years old (range 21–95); 74% of patients were female, while 49% of patients had BPPV on both sides, 26% just on the left side and the remaining 25% of patients only had BPPV on their right side. The most common vestibular co-morbidity in our patients was previous vestibular neuronitis (5%). A total of 38% of patients in our cohort also had a diagnosis of depression or anxiety. 36% had a diagnosis of hypertension. 13% had IHD and 9% had a diagnosis of DM. The median number of visits was 6 (range 1–38 visits).

**TABLE 1** Table with characteristics of participants.

Number of patients	138
Mean age	65 years
Standard deviation of age	12.8
Male:female	34:104
Side affected left:right:both	34:36:68
Number of patients with recurrence of BPPV	90
Number of patients with persistent BPPV	92

### Key points

1. Previous studies have linked recurrent or persistent BPPV to age, anxiety or/and depression and medical comorbidity.
2. Factors such as deprivation and the socioeconomic status have not been assessed.
3. In our retrospective powered cohort we showed that there is a positive correlation between recurrent or persistent BPPV and age.
4. We found no correlation with the presence of underlying anxiety/depression, arterial hypertension, ischaemic heart disease and diabetes mellitus and recurrent or persistent BPPV.
5. While one would have expected that the socioeconomic and educational status would have had an impact on recurrent/persistent BPPV, using the Scottish Index of Multiple Deprivation, we did not identify such link.

### 3.1 | Recurrent BPPV

Spearman's correlations were run between certain factors, namely number of recurrences and age, age group (in decades), SIMD and the presence of anxiety/depression.

Age group and number recurrences were significantly correlated ( $p$ -value = .01681, correlation coefficient 0.2032392).

Age and the number of visits were significantly correlated ( $t = 2.4952$ ,  $df = 136$ ,  $p$ -value = .01378, correlation coefficient 0.2092286).

There was no statistically significant correlation between SIMD and number of recurrences ( $t = 1.1368$ ,  $df = 44.872$ ,  $p$ -value = .217).

There was no statistically significant correlation between depression/anxiety and number of recurrences ( $t = -0.79643$ ,  $df = 92.191$ ,  $p$ -value = .4278). No statistically significant correlation was found between recurrent BPPV and having a diagnosis of hypertension ( $p$ -value = .1188), IHD ( $p$ -value = .5876) or DM ( $p$ -value = .6487).

### 3.2 | Persistent BPPV

Spearman's correlations were run between certain factors, namely the presence or not of persistent BPPV and age, age group (in decades), SIMD and the presence of anxiety/ depression.

There was a statistically significant correlation between age and having persistent BPPV ( $t = -2.0008$ ,  $df = 74.103$ ,  $p$ -value = .04907).

There was no statistically significant correlation between SIMD and having persistent BPPV ( $t = -0.33008$ ,  $df = 17.56$ ,  $p$ -value = .7452).

There was no statistically significant correlation between having a diagnosis of depression or anxiety and having persistent BPPV ( $t = -1.5135$ ,  $df = 121.14$ ,  $p$ -value = .1328). No significant correlation was found between having persistent BPPV and a diagnosis of hypertension ( $p$ -value = .0523), IHD ( $p$ -value = .4212) or DM ( $p$ -value = .6064).

## 4 | DISCUSSION

### 4.1 | Main findings

We identified statistically significant correlation between BPPV recurrences and age, indicating that recurrences are more likely in the elderly. We also identified a statistically significant correlation between age and having persistent BPPV. We did not identify any links between socioeconomic factors/deprivation in either recurrent or persistent BPPV. To our knowledge our study represents the first analysis of the association between socioeconomic variables and persistent or recurrent BPPV, not demonstrating, as above, any significant relationship between SIMD and having persistent BPPV, nor did it show any link between SIMD and having a higher number of recurrences of BPPV. This result is interesting as most disease processes appear to have a link with increased deprivation.<sup>6</sup>

Additionally, although a larger proportion of our patients had a diagnosis of the anxiety or depression, no relationship was found between having anxiety or depression and having more frequent or persistent BPPV. While previous work by Wei et al showed a statistically significant relationship between depression and recurrence of BPPV, in our cohort, we failed to show such correlation.<sup>7</sup> We also found no relationship between having persistent or recurrent BPPV and having a diagnosis of hypertension, IHD or DM.

### 4.2 | Factors affecting recurrent/persistent BPPV

The increased risk of BPPV in older group is well known, and previous studies have shown the link between age and chance of recurrence of BPPV. Previous studies have hypothesised the increase in recurrence rates in older patients may be related to utricular degeneration.<sup>8</sup>

This information could be vital for counselling patients in older age groups regarding their journey with BPPV. Informing them they are more likely to suffer from more episodes than younger people can both address expectations regarding prognosis, allow for additional education and help with managing resources as patients may need to be seen more frequently in a clinic.

Previous studies have also shown that patients can suffer from multiple peripheral causes of vertigo such as BPPV, vestibular neuritis and Meniere's disease.<sup>9</sup> However studies have shown that there is no association between having vertigo-inducing co-morbidities and recurrent BPPV.<sup>10</sup> In the same large-scale meta-analysis Li et al. found 13 different risk factors for recurrence of BPPV. Similar to our findings, age was a significant risk factor, but they also found gender and hypertension to be risk factors as well.

#### 4.2.1 | Study limitations and strengths

The main limitations of this study arise from its retrospective character and the associated bias. Additionally, patient notes extracted were not randomised, and as such our results may not be entirely representative of the BPPV population.

Additionally, due to the study design we did not include further factors that could play a role, such as vitamin D levels or lipid profile, which have been shown to play a role in recurrences and their severity; such factors, though, have been previously examined.

On the other hand, the present study is powered and the only study looking into the impact of socioeconomic factors on BPPV, shedding some light on the commonest peripheral cause of dizziness.

## 5 | CONCLUSIONS

Identifying clinical risk factors for recurrent and persistent BPPV is important when counselling patients after they are given a diagnosis. This study showed that there is a positive relationship between age and recurrent BPPV. On the contrary, persistent or recurrent BPPV were not associated with socioeconomic indicators of health status. Given its high prevalence and impact on quality of life and health services, further research is needed to identify methods to help patients who are prone to recurrent and persistent BPPV.

### AUTHOR CONTRIBUTIONS

**Christy M. Moen:** Performed the Data collection and the analysis and the writing of the paper. **Georgios Kontorinis:** Revised and approved the manuscript and agrees to be accountable for all aspects of the work. All authors approved the final draft of the paper.

### CONFLICT OF INTEREST STATEMENT

None of the authors have any conflict of interest.

### PEER REVIEW



The peer review history for this article is available at <https://www.webofscience.com/api/gateway/wos/peer-review/10.1111/coa.14050>.

### DATA AVAILABILITY STATEMENT

Research data are not shared but are available from the corresponding author upon reasonable request.

### ETHICS STATEMENT

Research ethics committee approval is not required for access to this retrospective data. Local Caldicott guardian approval was gained for this study.

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