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VISION CARE AS A STRATEGY TO PREVENT FALLS AMONG PEOPLE WITH MODERATE OR SEVERE INTELLECTUAL DISABILITY IN THE HOSTEL SETTING IN HONG KONG

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ABSTRACT

BACKGROUND

Factors contributing to the higher fall risk among people with intellectual disabilities (PIDs) are complex due to their discrete patterns of multimorbidity. Visual impairment, such as cataract, was common at old age and could be a crucial risk factor. Given the insufficient evidence regarding this relationship, the present study aimed at investigating this issue in a hostel setting in Hong Kong.

METHODS

This study was conducted in four hostels which served people with moderate to severe intellectual disability. Health data of residents collected in the year of 2022-23 was utilized for the current analysis. Data included fall risk, assessed by the Morse Fall Scale, as well as other health conditions (osteoporosis, osteoarthritis, cataract) and demographics (age and gender) among residents.

RESULTS

The sample consisted of 199 residents (85 were males and 114 females), with an age range of 22 to 76 years. Around 40% (85; 42.7%) of them aged above 45 years old. Among the whole sample, cataract was the most common health condition and its prevalence reached 27.14%. Those who aged 45-year or above were 4.61 times (95%CI 2.09-11.07) more likely to have cataract. Bivariate analysis results showed that presence of fall risk was associated with older age (above 45 years old; OR 2.38; 95%CI 1.28-4.49), diagnosis of cataract (OR 3.3; 95%CI 1.71-6.33) and osteoarthritis (OR 12.68; 95%CI 1.70-564.75). Logistic regression analysis further illustrated that cataract (p = 0.04) remained as a significant predictor of fall risk after controlling age, gender, osteoarthritis and osteoporosis in the model.

CONCLUSION

Our data showed that presence of cataract diagnosis was significantly associated with higher fall risk among PIDs in hostel setting. Given cataract was a prevalent condition especially among aging PIDs, early screening and intervention could be crucial components of fall prevention strategy in a hostel setting.

KEYWORDS

Aged care, fall prevention, Hong Kong

INTRODUCTION

Falls are a health crisis which accounted for one-third of deaths among elderlies aged 60 or above [1]. Deteriorations in physical and cognitive competences associated with aging were both considered as the reasons of increased likelihood of fall [2]. For example, peripheral sensory dysfunction and diminished capacity of executive function could both increase the physical and cognitive burden of maintaining posture balance, which in turn resulted in fall [3,4]. Some evidence further suggested that a fall episode could not only worsen existing gait and posture problems [5], but also result in the fear of future fall which drove elderlies to restrict daily activities. The vicious cycle between exacerbated physical deficits and fear of future fall, in the long run, resulted in a higher risk of fall, and even developing psychological problems such as depression [6,7].

Visual impairment associated with cataract was one of the leading causes of fall among elderlies [8, 9]. Owing to the partial or complete optical opacification of lens in eyes, cataract caused light to scatter instead of forming a sharp image on the retina, resulting in a reduction of the visual acuity [10]. One cohort study conducted in England found that elderlies with cataract were 1.36 times more likely to fall than those without this diagnosis [8]. Another study also reported that older people with cataract were significantly more likely to have history of fall than those without this diagnosis [9].

There were a few studies which had investigated the prevalence of cataract or other types of visual impairment among persons with intellectual disability (PIDs). An earlier study in Hong Kong reported the prevalence of 5.7% to 6.5% among those aged 40 years or above living in residential care facilities [11]. Some previous evidence had suggested that visual impairment could be more common among PIDs than the typically developing elderlies. Among a sample aged 60 years old or above, the prevalence of moderate to severe visual impairment were higher in the group of PIDs (27.9%) than those without the disability (0.66% and 13% among '60 to 69 years old' and '80 years old or above' groups respectively) [12].

Previous findings concerning the relationship between cataract and fall risk among PIDs were mixed [13,14]. For example, one study conducted in Australia found that visual impairment increased the fall risk by about two times among a sample of PIDs who attended a medical clinic [13], while another cohort study, also conducted in Australia, did not replicate similar relationship [14]. It would be interesting to explore this relationship in the unique residential setting in Hong Kong, which is considered as 'crowded and packed'. Indeed, one study revealed the problem of inadequate indoor space in hostels for PIDs in Hong Kong [15]. It is expected that the limited space and presence of physical obstacles could relate to the fall risk. Given visual acuity could be crucial to avoid obstacles and prevent from falling [16], the impact of cataract on their fall risk among PIDs could be more significant in this setting.

Given the above evidence, the primary objective of current research was to examine the accountability of cataract on the fall risk among persons with moderate to severe intellectual disability in Hong Kong hostel settings. As suggested by the empirical evidence, other related conditions such as age, the diagnosis of osteoporosis [17] and osteoarthritis [18] were also measured as covariates in order to investigate how these factors could independently predict the fall risk among the residents. The main hypothesis was that cataract could independently predict fall risk after controlling for age and other health related conditions. Given the potential higher risk of cataract among this group of population, how cataract could affect their fall risk was an important piece of information when designing effective fall prevention strategies.

METHODS

PARTICIPANTS

All participants were residents in the selected four hostels which served people with moderate to severe intellectual disability in Hong Kong. In these hostels, the health data of residents were collected in a yearly basis with the consent of parents or guardians, in order to monitor their health conditions and achieve early detection of any physical problems. For the purpose of this research, these secondary data were collected with the approval from the organization, and the relevant health data in the year of 2022 to 2023 were extracted for further analysis.

PROCEDURES

Before conducting data collection, research staff explained the research objectives and procedures to the Head and Hostel Managers of the organization in order to seek their approval. Upon receiving their approval, research staff were given the right to access to the

electronic health data stored in online data base with password protection. One experienced research staff was responsible for the data extraction and analysis processes.

DATA EXTRACTION

The main outcome variable was the residents' fall risk measured by the Morse Fall Scale (MFS) [19]. The MFS was a screening tool for evaluating the level of fall risk with six items, namely "history of falling", "secondary diagnosis", "ambulatory aid", "IV/Heparin lock", "Gait/Transferring" and "Mental status", which each of them scored from 0 to 30. Total scores of all items could differentiate the fall risk of PIDs as 'no' (score of 0 to 24), 'low' (25 to 50) or 'high' fall risk (51 or above). The MFS were completed by either occupational therapists or nurses in the hostels.

Besides the fall risk of participants, other relevant data was also extracted from the health data. The independent variable was the presence of cataract diagnosis. Other covariates included the demographics (age and gender), as well as the diagnosis of osteoporosis and osteoarthritis among residents.

Given the data period covered the COVID-19 pandemic, some residents chose to stay at their home for a long period of time to avoid infection in hostels. In order to minimize the potential bias, residents spending lower than 90% of time in hostels within the year of 2022 to 2023 were excluded from this study.

DATA ANALYSIS

For the purpose of data analysis, participants were assigned to either younger (below 45-year-old) or older subgroup (45-year-old or above). The three MFS risk levels were further transformed into a binary variable, with (low and high risk) or without (no risk) fall risk.

Fisher's exact tests and chi-square tests were used for the bivariate analyses, and logistic regression was conducted to measure the independent effect of measured variables on the fall risk level. Data analysis was conducted using the software IBM SPSS version 22.0.

RESULTS

The health data of a total of 204 residents in the four selected hostels was extracted, among which five residents were dropped out from the analysis based on the above exclusion criterion. Therefore, a total of 199 residents were included in this study and their demographic details were presented in Table 1. Among the resulting sample, 104 were males and 95 were females. Their mean age was 48.5 years old with only 13.6% of residents were below 35 years old, suggesting that most of them were at least in the stage of middle age. Nearly 30% of them aged over 55 years old. Using a cut-off of 45 years old, 85 and 114 participants belonged to the younger and older subgroup, respectively. The age distribution showed that ageing was a prominent issue in the four hostels.

TABLE 1: DESCRIPTIVE STATISTICS OF RESIDENTS (N=199)

		n	%
Age	25 or below	5	2.51%
	26-35	17	8.54%
	36-45	63	31.66%
	46-55	56	28.14%
	56-65	39	19.60%
	66 or above	19	9.55%
Gender	Male	104	52.3%
	Female	95	47.7%
Health conditions	Cataract	54	27.14%
	Osteoporosis	8	4.02%
	Osteoarthritis	10	5.03%
Fall risk	No risk	112	56.28%
	Low risk	66	33.17%
	High risk	21	10.55%

Among the residents in the four hostels, cataract was found to be the most common health condition and the prevalence reached 27.14%, followed by osteoarthritis (5.03%) and osteoporosis (4.02%; Table 1). Based on the scores in Morse Fall Scale, about one-third of them (33.17%) were classified as having low fall risk, while 10.55% of them were of high fall risk (Table 1). As shown in Table 2, cataract was found to be more prevalent among the older subgroup and they were 4.71 times (95%CI 2.21-10.08) more likely to receive this diagnosis when compared with the younger residents. Furthermore, presence of fall risk (with low or high risk) was 2.39 times (95%CI 1.33-4.29) higher in the older age group.

Bivariate analyses were conducted to examine the relationship between different health conditions and fall risk (Table 3). Results illustrated that presence of fall risk was significant more likely among those with the diagnosis of cataract (OR 3.30; 95%CI 1.71-6.33) and osteoarthritis (OR 12.81; 95%CI 1.59-103.15). Finally, logistic regression was conducted to investigate the independent effects of cataract, demographic details and other health conditions on the presence of fall risk (Table 4). It was found that cataract remained as a significant predictor after controlling gender, age, the diagnosis of osteoporosis and osteoarthritis, with an elevated likelihood of the presence of fall risk (OR = 2.47; 95%CI 1.22-5.01).

TABLE 2: PREVALENCE RATES OF HEALTH CONDITIONS AMONG THE WHOLE SAMPLE AND THE TWO AGE GROUPS

		All n (%)	Younger n (%)	Older n (%)	OR (95%CI)	p in chi sq tests
Cataract	Yes	54 (27.14%)	10 (18.52%)	44 (81.48%)	4.71	0.00*
	No	145 (72.9)	75 (51.72%)	70 (48.28%)	(2.21-10.08)	
Osteoporosis	Yes	8 (4.02%)	1 (12.50%)	7 (87.50%)	5.49	0.14[a]
	No	191 (95.98%)	84 (43.98%)	107 (56.02%)	(0.66-45.54)	
Osteoarthritis	Yes	10 (5.03%)	0 (0.00%)	10 (100.00%)	NA[b]	
	No	189 (94.97%)	85 (44.97%)	104 (55.03%)		
Fall risk	Yes	87 (43.72%)	27 (31.03%)	60 (68.97%)	2.39	0.00*
	No	112 (56.28%)	58 (51.79%)	54 (48.21%)	(1.33-4.29)	

a p value in Fisher's Exact test

b Odds ration could not be calculated due to an empty cell

* significant at 0.05 level

TABLE 3: RELATIONSHIPS BETWEEN VARIOUS HEALTH CONDITIONS WITH FALL RISK

Parameters		No fall risk n (%)	With fall risk n (%)	OR (95%CI)	p in chi sq tests
Cataract	Yes	19 (35.19%)	35 (64.81%)	3.30 (1.71−6.33)	0.00*
	No	93 (64.14%)	52 (35.86%)		
Osteoarthritis	Yes	1 (10.00%)	9 (90.00%)	12.81	0.01*[a]
	No	111 (58.73%)	78 (41.27%)	(1.59−103.15)	
Osteoporosis	Yes	2 (25.00%)	6 (75.00%)	4.07	0.08[a]
	No	110 (57.59%)	81 (42.41%)	(0.80−20.71)	

[a] p value in Fisher's Exact test

* significant at 0.05 level

TABLE 4: LOGISTIC REGRESSION PREDICTING FALL RISK AMONG RESIDENTS

	B	SE	P value	Exp(B)	95% CI
Constant	-0.90	0.27	0.00	0.41	
Gender	0.00	0.31	0.99	1.00	0.54-1.85
Age group	0.46	0.32	0.15	1.29	0.84-3.00
Osteoporosis	1.42	0.85	0.10	4.13	0.78-21.88
Osteoarthritis	1.97	1.10	0.07	7.15	0.84-61.16
Cataract	0.90	0.36	0.01*	2.47	1.22-5.01

* significant at 0.05 level

DISCUSSION

The current research aimed to provide preliminary evidence concerning the prevalence of cataract and how it could predict the fall risk of PIDs in a hostel setting. Our results showed that cataract was the most prevalent health condition among our residents, with more than one-fourth of them received the diagnosis. Furthermore, cataract not only increased the fall risk by approximately three times, the higher risk remained significant even after controlling age, gender, the diagnosis of osteoporosis and osteoarthritis in a subsequent regression analysis. This finding supported our hypothesis that visual impairment with cataract was a specific predictor for fall risk of ID in the residential setting.

Our present results echoed with previous findings concerning the association between cataract and fall [8,9]. The reduced visual acuity with cataract was proposed as the reason of inflated fall risk among PIDs [16]. Particularly, impairments in central and peripheral visual field due to cataract caused a biased sensory input [20]. This could result in posture imbalance [21], and eventually increased the chance of fall. Although the packed environment in four hostels was not objectively measured in this research, it was likely that environmental factors could intensify the relationship between poor visual acuity and fall in this setting.

The relationship between cataract and fall risk could be elucidated by factors other than worsened visual acuity. Dysregulated circadian rhythm and sleep hormones release could be a result of cataract due to declined amount of light input, with evidence showing that cataract surgery could result in improved regulation of circadian rhythm [22,23]. Furthermore, the resulting poor sleep quality could further deteriorate abilities of coordination and gait balance which increased the possibility of fall [24]. Future research would be necessary to investigate the relationships between cataract, sleep quality and fall risk among PIDs.

It should be noted that daily activities of PIDs in hostels could potentially result in the heightened vulnerability of fall. Due to the technology advancement, people spend long time in using mobile phone or tablets nowadays. Similarly, many PIDs in hostels also enjoyed using the electronic devices as an entertainment, such as watching movies or playing games. Lengthy usage of these devices among PIDs could result in computer vision syndrome including eye strain and blurred vision [25], which may in turn cause an increase in their fall risk.

Despite cataract, our findings also showed that both osteoporosis and osteoarthritis were associated with the fall risk among residents. Given the current research employed a cross-sectional design, the direction of relationships could not be found from our data. Still, current findings were consistent with previous empirical evidence concerning the roles of these conditions in fall risks. For example, osteoarthritis was found to be a significant risk factor of fall in Dore et al.'s study [18]. Another study showed that people with the diagnosis of osteoporosis did not show lower balance confidence nor poor obstacle avoidance abilities, and thus this diagnosis was not associated with a higher fall risk [17]. More evidence would be necessary to clarify whether these conditions could cause a heightened fall risk among PIDs.

There were a few limitations which needed to be considered when interpreting the current results. First, the sample size may not be sufficient to detect significant results despite several trends were observed (e.g. association between age and osteoporosis). Second, the current sample only included residents in a hostel setting. Given that the environments in hostel and at home could have great discrepancies, the current findings had limited

external validity in community settings. Third, without the use of control group, our data was not able to compare differences between ID and typical developing peers in hostel settings, or between PIDs with different etiologies (e.g. Down's syndrome, Fragile X syndrome) [26]. The inclusion of control group could provide a clearer picture on the role of cataract on fall risk among different population. Finally, MFS was used as the fall measurement tool and only nominal data (with or without fall risk) was employed as the outcome variables. The results could be enriched if it could be supplemented with a scale which measured the severity of fall risk in a continuous scale.

IMPLICATIONS FOR PRACTICE AND POLICY

The current results provided useful implications to improve the practice and policy in the care of PIDs in hostel setting. Fall prevention is considered as an important task in hostels, especially for ageing PIDs. The present study successfully identified cataract as an important health condition associated with high fall risk. Therefore, in daily practices of hostels, vision care can serve as a component of fall prevention strategies. It is acknowledged that the delivery of assessment and intervention for cataract may be difficult due to the mood and behavioral problems among PIDs. However, with a higher level of awareness of the importance of their vision, any screening results of cataract or vision status can provide useful information for the hostel to determine the necessary fall precaution strategies. For instance, environmental modification measures can be considered, such as arranging a less crowded area for residents with poorer vision, as well as more regular clean up to remove obstacles on the floor in hostels.

In the policy level, the government can consider providing additional support in promoting vision care services in hostels. Li and her colleagues suggested that although there were various challenges of providing vision care for PIDs, the situation could be improved by delivering more trainings to promote knowledge and awareness of this issue for different stakeholders including optometrists, as well as other caregivers and care workers [27]. As a result, more resources and efforts will be required to promote readiness of healthcare professionals to effectively assess and intervene the visual impairments among PIDs.

CONCLUSIONS

The current study revealed that cataract was a prevalent condition among residents in hostels, especially among those who aged over 45 years old. Furthermore, the diagnosis of cataract was also found to be a predictor of heightened fall risk in a hostel setting. Particularly, cataract uniquely predicted fall risk after controlling demographics, and the diagnosis of osteoarthritis and osteoporosis. The results recommended vision care as a possible monitoring strategy to alleviate fall risk among PIDs in hostels.

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