Factors associated with mobility limitations in the elderly: a systematic review

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Abstract

Objective. To systematically review the prevalence and incidence of mobility limitations in the elderly people and their associated factors. Materials and methods. Articles in the electronic literature were searched via PubMed, Scopus, Lilacs, SciELO, PAHO, MedCarib, Repisdisca, Wholis, IBCES, PEDro, Medline and Bireme (2012-2016). The instrument STROBE was used to analyze the quality of the work and the PRISMA recommendation was used to structure the review. Results. Nine studies were included. The prevalence of mobility limitations ranged from 58.1 to 93.2% and the incidence ranged from 23 to 53.7%. Studies provided evidence of association of mobility limitations in the elderly population with high BMI, low 25-hydroxy vitamin D, sarcopenia, fragility, chronic pain, functional dependence, advanced age in women, low hip flexion, sedentary lifestyle, and social support difficulties. Conclusion. Mobility limitations in the elderly had high prevalence and incidence, and there was evidence of association with nutritional, functional and social factors.

Keywords: aged; aging; mobility limitation; risk; etiology; association

Resumen

Objetivo. Revisar sistemáticamente la prevalencia e incidencia de las limitaciones de movilidad en los ancianos y sus factores asociados. Material y métodos. Se realizaron búsquedas de artículos en la literatura electrónica a través de PubMed, Scopus, Lilacs, SciELO, PAHO, MedCarib, Repisdisca, Wholis, IBCES, PEDro, Medline y Bireme (2012-2016). El instrumento STROBE fue utilizado para analizar la calidad del trabajo y la recomendación de PRISMA para estructurar la revisión. Resultados. Se incluyeron nueve estudios. La prevalencia de limitaciones de movilidad varió de 58.1 a 93.2% y la incidencia de 23 a 53.7%. Los estudios aportaron evidencia de asociación de limitaciones de movilidad en los ancianos con alto IMC, 25-hidroxivitamina D baja, sarcopenia, fragilidad, dolor crónico, dependencia funcional, edad avanzada en las mujeres, flexión de cadera baja, sedentarismo y dificultades de apoyo social. Conclusiones. Las limitaciones de movilidad en los ancianos presentan alta prevalencia e incidencia, y hay evidencia de asociación con factores nutricionales, funcionales y sociales.

Palabras clave: anciano; envejecimiento; limitación de la movilidad; riesgo; etiología; asociación

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The aging process of the population has become increasingly common in most of the countries in the world as a result of scientific, medical and technological advances in the last decades increasing life expectancy. Longevity raises concern about the quality of life of the older population because aging is often accompanied by a decline in physical, cognitive and sensory capacity, which may cause limit physical mobility. Mobility is defined as the ability to move independently and safely from one place to another; it represents an essential aspect of daily life and favors the autonomy of older adults.

Mobility limitations are frequent functional problems in elderly people, especially in the oldest ones (≥80 years old). The World Health Organization (WHO) states that about 20% of people over 70 and 50% of people over 85 have some type of disability or movement limitation. Although many risk factors and aspects associated with mobility limitations have been described in the literature, their relative importance and independent contribution to the long-term risk of loss of mobility is still unclear.

Social, nutritional, and functional factors may be involved with mobility limitations. Mobility restrictions are generally associated with physical deconditioning, and they may have an impact on the functioning of physiological systems. The reduction of physiological reserves in older adults over the years facilitates functional limitations. However, mobility limitations may occur in several ways, such as difficulties to move, going up or down stairs. Over time, major restrictions involving the use of wheelchairs (using these with insecurity) or locomotion assistance devices may occur.

Also, these limitations referred as physical immobility by some studies are the opposite of “mobility” and they are the ten most frequent health problems among elderly people of both sexes, having some association with several levels of functional dependence. Nevertheless, some gaps need to be filled to understand what types of factors are most closely associated with the phenomenon. Given this context, this systematic review sought to identify evidence of prevalence, incidence, and factors associated with mobility limitations in the older adults.

Materials and methods

This is a systematic review of the last five years (2012-2016). The review investigated the evidence of the prevalence or incidence of mobility limitations in the elderly people and their associated factors.

Identification of relevant studies

Papers were sought in the following databases: PubMed, Scopus, Lilacs (Latin American and Caribbean Health Sciences Literature), SciELO (Scientific Electronic Library Online), PAHO (Pan American Health Organization), MedCarib (Caribbean Health Sciences Literature), Repidisca (Pan American Network for Information and Documentation in Sanitary Engineering and Environmental Sciences), Wholis (WHO Library Information System), IBECs (Spanish Bibliographical Index in Health Sciences), PEDro (Physiotherapy Evidence Database), MEDLINE (Medical Literature Analysis and Retrieval System Online) and Bireme (Latin American and Caribbean Center on Health Sciences Information). They were found by doing a search for the following terms: Mobility Limitation, Walking Difficulty, Dependent ambulation, Aged or Aging, Risk or Etiology, Measures of Association or Outcome.

Selection of studies

Those articles that assessed or identified mobility limitations in older people were included. Papers published in Portuguese, English, and Spanish were accepted. Studies of various types –observational, sectional, longitudinal, prospective, retrospective– and papers published in congress proceedings as well as dissertations were searched; theses and abstracts were excluded.

The instrument known as “Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)” was used to verify the items recommended in observational studies. This instrument lists information that should be present in the title, abstract, introduction, methodology, results, and discussion of scientific articles that describe observational studies, contributing to an adequate report of this type of study. Also, the recommendation of the “Main Items for Reporting Systematic Analyses and Meta-Analyses (PRISMA)” was followed to structure the review. This recommendation consists of a set of items that help researchers to write systematic reviews and/or meta-analyses appropriately.

The bibliographic research was carried out between November of 2015 and December of 2016.

Results

A total of 2189 articles were found, whose abstracts were read. Whenever there were doubts about the content and subject searched, the article was read in full. Duplicated
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Articles were then excluded, and the list of references of the chosen articles was analyzed for new studies. Thirteen articles were selected and submitted to STROBE\textsuperscript{10} (figure 1). In the end, nine articles were included in the study (table I).\textsuperscript{5,7,9,12-17}

The studies had varied approaches and a higher percentage of women in their samples, and one study included only females in the sample.\textsuperscript{13} Sample sizes ranged from 90 to 5,450 individuals, with a mean age between 69.1 and 82.1 years. This demonstrates the scope and extent of these studies, covering several age subgroups within the same life stage. The largest sample was seen in a “longitudinal population” study carried out in the United Kingdom (UK).\textsuperscript{16}

Regarding the location, three studies were performed in North and Central America,\textsuperscript{12-14} one study in South America,\textsuperscript{17} three studies in Europe,\textsuperscript{5,9,16} and two studies in Asia\textsuperscript{7,15} pointing out to a variety of population, mostly composed of older individuals.

**Mobility assessment**

Physical mobility is one of the aspects addressed when assessing functional capacity. It is the independent and safe physical performance of individuals in space locomotion. Individuals who are insecure or have some degree of dependence on locomotion are classified as having mobility limitations. In the review, three studies evaluated mobility based on the difficulty of walking 400 m or climbing and going down 10 steps.\textsuperscript{5,12,14} One study evaluated the difficulty of walking 100 meters, going up stairs and performing activities of daily living.\textsuperscript{16} The other studies used the 6-minute walking test (6MWT),\textsuperscript{15} Barthel index,\textsuperscript{9} Euronut-SENECA guide,\textsuperscript{13} self-report,\textsuperscript{5,7,17} interview\textsuperscript{12,16} (Houston and colleagues) in 2013,\textsuperscript{12} questionnaire,\textsuperscript{7} medical records and ADLs.\textsuperscript{9}

**Prevalence, incidence, and factors associated with mobility limitations**

The studies indicated a prevalence of mobility limitations in the elderly person ranging from 58.1 to 93.2\%, and an incidence varying between 23 and 53.7\% (table II). Only one study identified “mobility disability” (22\% incidence).

Most of the studies used a variety of statistical analyses to demonstrate the factors associated with mobility limitations. However, there were logistic regression analyses in most of the research.

The study with the largest sample (5,450 older adults)\textsuperscript{16} found that fragile older adults had a greater incidence of physical mobility limitation, and the study with the smaller sample (90 older adults)\textsuperscript{13} showed an association with sarcopenia. Studies with samples of
over one thousand elderly people showed association with nutritional, functional and social factors, while those with samples of less than one thousand elderly people showed a stronger association with functional factors (table II).

The social factors that may place the elderly population with mobility limitations at a higher risk of developing disabilities include family composition by other individuals, precarious financial situation and lack of housing.7

According to the review, mobility limitations in advanced ages can act as a cause of illnesses as they affect the reduction of functional reserves in the elderly person (functional dependence)9 and they can also be a consequence when physical and metabolic compromises generate weakness and fragility (sarcopenia, sedentary lifestyle, high BMI, low 25-hydroxyvitamin D).12-15

**Terms used to express the context of the mobility limitations**

In the case of physical mobility, most of the studies (eight studies)5,7,12-17 used the descriptor “mobility limitation” to refer to the difficulties of locomotion. However, one research also mentions the term “immobility” being treated and understood within the same context as mobility limitations.9

**Discussion**

Mobility, i.e. the ability to move, is an important indicator of functional independence in older adults. It is inevitable to the instinct of human survival, allowing the organisms to access the means to integrate coexistence and basic health conditions. This review summarized the evidence of the prevalence, incidence and associated factors of mobility limitations in older adults, and showed a high prevalence and incidence of such limitations, expected among older populations.7,9,14,15 However, the variety of forms of mobility evaluation worked as a limiting factor in the study.

Limitations become more significant in older people (aged 80 years or more), indicating that this age group is vulnerable to the development of movement limitations. Aging and diminishing physiological reserves increase the risk of disease and disability through a progressive
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Many factors are associated with mobility limitations in the elderly population. Regular physical activity reduced daytime fatigue; such activity and improved sleep quality may represent robust strategies to preserve mobility in the elderly population. Women presented a higher prevalence of limitations than men. Moreover, difficulties related to social support (family composition, satisfaction with the financial situation and the housing tenure) proved to be associated with disability and limited physical mobility. Social support is important to prevent health implications by providing favorable conditions for the quality of life of both the elderly people and their caregivers. Especially among the less favored financially elderly individuals, lack of support is associated with restrictions on movement and functional dependence.

Other authors mentioned that sedentary and low-income older adults had a high risk of developing mobility limitations, along with the risk of fatigue, sleep deficit and decreased motor system response to movement. Other factors including high BMI and poor physical performance were also shown to be associated with mobility limitations. Elderly people with high fat

Table II

**EVIDENCE FOR THE FACTORS ASSOCIATED WITH MOBILITY LIMITATIONS IN THE ELDERLY PEOPLE BASED ON STUDIES SELECTED BY THE SYSTEMATIC REVIEW**

<table>
<thead>
<tr>
<th>Study (First author and year)</th>
<th>Prevalence/Incidence Mobility limitation</th>
<th>Statistical tests</th>
<th>Associated factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Houston et al., 2013)12</td>
<td>Incidence 36.6% (Mobility limitation)</td>
<td>Chi-square test;</td>
<td>Low 25-Hydroxyvitamin D</td>
</tr>
<tr>
<td></td>
<td>Incidence 22.0% (Mobility disability)</td>
<td>Kaplan–Meier method; Tests for linear trends; Cox proportional hazard regression models.</td>
<td></td>
</tr>
<tr>
<td>(Alva et al., 2013)13</td>
<td>Non-specified</td>
<td>Analysis of variance (ANOVA); Chi-square test; Fisher exact test; Logistic regression model.</td>
<td></td>
</tr>
<tr>
<td>(Murphy et al., 2014)14</td>
<td>Incidence 53.7% (Mobility limitation)</td>
<td>Chi-square test; Spearman’s correlation coefficient (r); Schoenfeld residuals; Logistic regression model.</td>
<td></td>
</tr>
<tr>
<td>(Yeom et al., 2015)15</td>
<td>Prevalence 90% (Mobility limitation)</td>
<td>T-test; Scheffe post hoc test; Multiple regression analysis.</td>
<td></td>
</tr>
<tr>
<td>(Gale et al., 2015)16</td>
<td>Prevalence 93.2% - Fragile elderly (Mobility limitation)</td>
<td>All prevalence estimates were weighted for sampling probabilities, non-response, and differential sample loss.</td>
<td></td>
</tr>
<tr>
<td>(Dellaroza et al., 2013)17</td>
<td>Non-specified</td>
<td>Rao-Scott test of association.</td>
<td></td>
</tr>
<tr>
<td>(Tanjani et al., 2015)7</td>
<td>Prevalence 76% - Women -(Mobility limitation)</td>
<td>Chi-square test; T-test; Logistic regression analysis.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prevalence 63% - Men - (Mobility limitation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Stenholm et al., 2015)5</td>
<td>Incidence 23% (Mobility limitation)</td>
<td>Random survival forests (RSFs) method.</td>
<td></td>
</tr>
<tr>
<td>(Clerencia-Sierra et al., 2015)9</td>
<td>Prevalence 89.39% – Overall – (Mobility limitation)</td>
<td>Exploratory factor analysis; Pearson’s correlation coefficient; Tetrachoric correlation matrix.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prevalence 91.43% - Women – (Mobility limitation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Prevalence 86.72% – Men – (Mobility Limitation)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Body mass index
acumulación tienen más limitaciones para moverse y realizar las actividades básicas de la vida diaria (ADL).*

Ambos bajos peso y obesidad están asociados con un alto riesgo de desarrollo de limitaciones de movilidad en personas mayores.* En los adultos mayores con bajo peso y malnutrición experimentan niveles significativos de limitaciones de movimiento. En el otro lado, la adiposidad intermuscular incrementada está positivamente asociada con limitaciones de movilidad entre el adulto mayor de ambos sexos.* Por lo tanto, el estado nutricional es un factor independientemente y positivamente asociado con limitaciones funcionales de movilidad y discapacidad.*

En este contexto, se realizó un estudio que observó que la incidencia de malnutrición es alta en los residentes mayores con sarcopenia, indicando que la asociación de sarcopenia con el peso corporal limitado es esencial, especialmente con la dificultad de subir las escaleras.* La sarcopenia es un enfoque clínico común en la población adulta mayor. Es una condición que se caracteriza por un progresivo y generalizado catabolismo de tejido de huesos y músculo, con función y cuando esta condición coexiste con exceso de grasa corporal, se define como sarcopenia obesa.** Ambos sarcopenia** y sarcopenia obesa** son asociados con reducción de movilidad en los mayores. Allí, los mayores con peso y equilibrio corporal son restricciones a un posible riesgo de desarrollo de limitaciones de movilidad.

Un estudio proyectivo en el estado de los Estados Unidos encontró una asociación de limitaciones de movilidad en los adultos con niveles bajos de vitamina D (25(OH)D) menores que 50 y 50 a 75 nmol/L presentó un mayor riesgo de desarrollo de limitaciones de movilidad, destacando que la nutrición ineficiente representa un factor favorizando limitaciones de movilidad. La prevención o tratamiento de niveles bajos de vitamina D (25(OH)D) puede ofrecer una manera de reducir el riesgo de limitaciones de movilidad en los adultos mayores.

En el caso de los marcadores de movilidad física, los indicadores más importantes son el sexo, las mujeres, el dolor y rigidez, la presencia de reflejos primitivos, y la tremor.† La pérdida de movilidad con el envejecimiento se debe a la prevención y tratamiento de la función neuromuscular. Por lo tanto, entender diversidad factores es necesario para identificar los mejores métodos para evitar el riesgo de déficit y incapacidades.

En el caso de los estudios presentados, las limitaciones de movilidad se perciben como asociadas con varios niveles de dependencia funcional y son más a menudo presentes en personas mayores, incluso la posibilidad de desarrollo en el joven y en los adultos mayores de comorbilidades no pueden ser negados.†† Limitaciones pueden ser la causa o consecuencia de comorbilidades adquiridas a lo largo de la vida. Además, los asociados factores son varios, llegando de aspectos relacionados a la pérdida de fuerza, balance y muscular poder a déficit nutricionales y problema del apoyo social.*

**Conclusión**

Se concluyó que las limitaciones de movilidad en los mayores son un problema prevalente y natural del envejecimiento, y que hay evidencia de asociación con factores nutricionales, déficit nutricionales y dificultades de apoyo social, así como factores funcionales (funcionalidad dependiente, estilo de vida sedentario, entre otros). Por lo tanto, las limitaciones de movilidad pueden ser la causa o consecuencia de enfermedades. En este contexto, se advertió que las limitaciones deben investigarse, estudiarse y entenderse en un enfoque multifactorial, con el objetivo de permitir la ciencia a avanzar en el entendimiento de sus implicaciones para la salud de los mayores.

Declaración de conflictos de intereses. Los autores declaran que no hay conflicto de intereses.

**Referencias**

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