

Review article

Self-care experiences and behaviors in people with osteoporosis: A meta-synthesis

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ABSTRACT

Osteoporosis is a chronic systemic skeletal disease that can benefit from patient-led self-care behaviors. The purpose of this meta-synthesis is to summarize the knowledge about the experiences in self-care behaviors, according to Riegel's middle-range theory of self-care, of patients affected by osteoporosis. A systematic review of the literature and a meta-synthesis of the results were performed to identify qualitative and mixed-method studies through database research conducted on six databases until June 2023 that identified 27 articles. Three dimensions of self-care were recognized within the articles: 'maintenance' was the most reported, mostly associated with therapy adherence; 'monitoring', predominantly related to instrumental test; and, 'management', mainly related to the management of symptoms. A cross-cutting topic that emerges and has been shown to be relevant is that of the relationship with health professionals.

1. Introduction

Osteoporosis is a systemic skeletal disease characterized by loss of bone mass and microarchitectural deterioration in bone tissue that occurs as a consequence of dysregulation in the process of bone resorption and formation [1,2]. The prevalence of osteoporosis is estimated to be in the range 4–40 %, affecting over 200 million people worldwide, values that are expected to increase up to 240 % by 2050 [2]. It is also assumed that globally 30 % of women over 50 years of age have osteoporosis [2]. Regarding Europe, in 2019 osteoporosis affected approximately 32.0 million people in the 27 European countries plus the UK and Sweden, of which 6.5 million were men and 25.5 million were women, representing 3.5 % (i.e. €55.3 billion) of the total expenditure of the European Union for healthcare, mostly associated with the cost of fragility fractures [3]. Approximately 21 % of women aged 50 to 84 years are diagnosed with osteoporosis in the 27 European countries, with a prevalence of 5.6 % in 2019, ranging from 3.7 % in Cyprus and Ireland to 6.3 % in Italy [4].

Osteoporosis is an underdiagnosed condition that is often defined as a 'silent disease' and cannot be diagnosed until fracture or other

complications occur [2,5]. Indeed, bone fractures due to bone fragility (defined as fragility fractures) are the most common complications of osteoporosis, being directly associated with increased morbidity and mortality (except for forearm fractures) and are often the element leading to diagnosis [1,2,4]. Fragility fractures may lead to subsequent more serious or compression fractures [2,5].

Following an osteoporotic fracture, patients experience many difficulties, notably chronic pain, which is frequently the first clear symptom of the disease [5]. Furthermore, disability, depression, nursing home stay, limitation of self-care ability and physical fitness and also limitation of social functions could be other important consequences related to osteoporosis that have a negative impact on patients' quality of life [5,6].

In this context, it remains fundamental to promote self-care in order to reduce the negative consequences related to osteoporosis. As described by Riegel et al. [7] with their middle-range theory, self-care is "a process of maintaining health through health-promoting practices and managing illness" (p. 195), composed of three dimensions: self-care maintenance, self-care monitoring and self-care management. Self-care

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maintenance is defined as the whole range of behaviors used by patients with a chronic illness to maintain physical and emotional stability; self-care monitoring refers to the process of observing changes in signs and symptoms; and self-care management is defined as the response to signs and symptoms when they occur [7]. As described by the literature, self-care could increase patients' quality of life, decrease hospitalization rates and reduce mortality [4,8–10]. Furthermore, as observed in other populations suffering from chronic diseases, self-care behaviors could reduce re-hospitalization rates, improve patients' quality of life and also improve clinical disease-specific outcomes, such as systemic oxygen consumption, blood pressure and insulin resistance [9,11], which could limit patients' signs and symptoms [12], improve therapy adherence [10,13] and even contribute to a reduction in the incidence and prevalence of certain diseases [14]. For patients with chronic diseases such as osteoporosis, it may be necessary to adapt self-care to the presence of symptoms or complications [6]. Many self-care behaviors should be conducted to manage osteoporosis, mostly referable to the dimension of prevention and self-care maintenance: self-care strategies include nutrition (with adequate calcium and vitamin D intake), weight-bearing and/or resistance physical activity, fall prevention strategies, improved risk awareness and cessation of smoking [5,15].

However, although several systematic reviews [16–20] were conducted on the osteoporotic population, with a particular focus on describing treatment, screening programs, prevention, diagnosis and management, little material can be found on self-care: in fact, a literature review [21] addresses topics of self-care maintenance related to educational strategies for improving therapeutic adherence and healthy lifestyles, however, not delving into the dimensions of self-care monitoring and management and not describing the patients' lived experiences of self-care behaviors. This represents a gap in the literature because knowing the perspective of patients with respect to the broader dimensions of self-care can make experiences, difficulties, attitudes and needs related to this disease more understandable. Indeed, the self-care culture needs to be prompted to establish an accumulated evidence base [22] that can be transmitted and adapted to the specific needs of chronic diseases. For example, in the case of osteoporosis, the synthesis of current experiences of patients' self-care behaviors could help healthcare professionals to become more aware of the effects and the impact of self-care, thus adapting and promoting self-care behaviors, mostly through counseling and educational interventions as reported by Alvaro et al. [21].

Analyzing self-care in people with osteoporosis according to the middle-range theory of self-care [7] can improve the quality and effectiveness of the health interventions that will then be developed, thus following a theory-based approach [22].

The perspective provided by this theoretical framework supports the rationale of the study by guiding the process of data selection, categorization, and analysis, guiding the researcher in identifying the specific maintenance, monitoring, and management behaviors enacted by people with osteoporosis.

Furthermore, this meta-synthesis could be an additional step in the development of tools capable of measuring self-care levels in the osteoporotic population [23] and, consequently, a basis for developing tailored interventions aimed at filling gaps in the self-care behaviors of these patients, contributing to an improvement in their quality of life.

Therefore, the aim of this meta-synthesis is to summarize the knowledge about the experiences regarding self-care behaviors (maintenance, monitoring and management) in patients affected by osteoporosis.

2. Methods

The review protocol was registered on PROSPERO (number CRD42022342039) on 5 July 2022.

2.1. Study design and search strategy

A systematic literature review was conducted to identify the evidence that best frames the research problem. The search in the databases began in May 2022 and ended in June 2023 (when were repeated to include additional articles) and followed the PRISMA statement to improve the transparency of qualitative study reporting [24].

The search terms, appropriately combined through Boolean operators, were adapted for use within the bibliographic databases by applying specific filters if necessary. No time filters were applied and only studies in the English language were considered. Searches were repeated before the final analysis, in June 2023, to include additional articles.

Each article was also examined for sample characteristics: the authors included studies on elderly male and female patients with senile or postmenopausal osteoporosis (primary osteoporosis), with or without fragility fractures. On the other hand, articles on young and adult patients, patients with secondary forms of osteoporosis and patients with renal failure or neoplastic disease were excluded.

The report selection was also guided by SPIDER [25,26] as a search strategy tool as follow:

- Sample: Elderly male and female patients (>65 years) suffering from senile or postmenopausal osteoporosis, with or without fragility fractures
- Phenomenon of Interest: Disease management and control: patients' behaviors and attitudes
- Design: Any design that involves qualitative data collection and analysis
- Evaluation: Patients' experiences and perceptions
- Research type: Qualitative (qualitative method).

Finally, the search strategy, used in each database, was guided by the following keywords combined with the Boolean operators "AND" and "OR" according to the following:

((Osteoporosis OR Osteoporos* OR "Senile* Osteoporos*" OR "Age-Related Bone Loss*" OR "Age Related Bone* Loss*" OR "Age-Related Osteoporos*" OR "Age Related Osteoporos*" OR Osteoporosis, Postmenopausal OR "Perimenopausal Bone* Loss*" OR "Postmenopausal Bone* Loss*" OR "Post-Menopausal Osteoporos*" OR "Postmenopausal Osteoporos*") AND ("Disease Management" OR "Disease Management*" OR "prevention and control" OR Health Behavior OR Health* Behavior* OR Health* Behaviour* OR "Health-Related Behavior*" OR "Health-Related Behaviour*" OR "Health Related Behavior*" OR "Health Related Behaviour*" OR "Risk Reduction Behavior" OR Lifestyle Risk Reduction* OR Risk Reduction* OR Behavior OR Behavior* OR Behaviour* OR Healthy Lifestyle OR Health* Lifestyle* OR "Health* Life Style*" OR "preventive measure*" OR "Attitude to Health" OR attitude OR attitude* OR health attitude* OR experience* OR Perception OR perception* OR "patient* experience*" OR "patient* perception*" OR disease experience* OR disease perception*)) AND ("Qualitative Research" OR qualitative* OR "qualitative study" OR "qualitative studies" OR "qualitative method*" OR "qualitative approach" OR "qualitative data" OR "qualitative data analysis" OR "qualitative data synthesis" OR "qualitative data collection")

2.2. Data sources

Primary evidence was searched within the major biomedical databases: PubMed, Web of Science, ProQuest, CINAHL, Scopus and Cochrane.

2.3. Study selection

Studies with qualitative and mixed-method designs were included to explore and learn about the phenomenon of interest in its experiential

and perceptual dimensions. Any study involving qualitative data collection and analysis was included. In mixed-method studies, only qualitative data were extracted and analyzed. Studies with quantitative design, systematic reviews and generally all secondary sources were excluded.

The decision with respect to the inclusion of the reports was guided by middle-range theory of self-care of chronic illness [7], prompting the authors to scrutinize the reports for aspects of self-care maintenance, monitoring, and management applied to the context of osteoporosis. Thus, inclusion was guided by the theoretical basis and the research question, which led reviewers to include articles that fully answered the main research question.

The eligibility of full-text articles was verified by two independent reviewers (C.T. and V.B.M.) together with a third reviewer (G.P.) in case of disagreement.

2.4. Data extraction

Two reviewers (C.T. and V.B.M.), once the studies were selected, completed a data extraction table (Table 1) noting and reporting the main characteristics of each study. Data were collected for each of the studies on Author (Year), Country, Aim(S), Study Design, Methodology for Data Collection/Methodology for Data Analysis, Sample size (N), Sample-Women (%), Sample-Age (Mean, Range or SD), Emerging themes, Main conclusions.

2.5. Quality and risk of bias assessment

Two reviewers (C.T. and V.B.M.) independently assessed the overall methodological quality of the articles included in the review and the risk of bias using the JBI Critical Appraisal Tool for Qualitative Research [27]: the 10 criteria of the appraisal tool can be found as a caption in Table 2. Any of the 10 items of the checklist can be answered with 'yes', 'no', 'unclear', or 'not applicable'. Only studies with a score of at least 6 'yes' were included in the review, as they were considered to have good methodological quality and an irrelevant risk of bias.

3. Results

3.1. Study selection (flow of studies)

As shown in Fig. 1 (the PRISMA flowchart), the initial search strategy produced 3580 potentially relevant articles. After a deduplication process, 3453 articles were excluded after evaluation of the title and abstract. This phase led to the identification of 75 reports, of which 73 were retrieved and subsequently evaluated for eligibility. After reading the full text, the two reviewers (C.T. and V.B.M.) independently selected the reports to include and agreed on 27 articles; 46 studies were excluded for the following reasons: wrong study design ($n = 27$), wrong population ($n = 8$), wrong focus ($n = 6$), foreign language ($n = 3$) and wrong outcome ($n = 2$).

3.2. Study characteristics

The selected studies have been published from January 2001 to May 2023. The main characteristics of each study are presented in Table 1.

The studies included in the meta-synthesis provide a broad international overview and valuable insights into self-care practices in different geographical contexts. Nine articles were produced in Canada [28–36], five in the USA [37–41], four in the UK [42–45], two in Denmark [46,47] and one each in Australia [48], Brazil [49], the Netherlands [50], Norway [51], France [52], Belgium [53] and Iran [54]. North America, with 14 studies (nine from Canada and five from the USA [28–41]), predominantly examines medication adherence and patient attitudes toward therapy, while South America is represented by a single study from Brazil, which explores self-management practices and

recovery of well-being in osteoporosis patients [49]. European studies [42–47,50–53], on the other hand, address a broader range of topics, such as medication adherence, lived experiences of patients, lifestyle adjustments, and barriers to initiating treatment, with UK research placing particular emphasis on the role of general practitioners and therapy adherence. Contributions from other regions are sparse: one Australian study [48] investigates ambiguities in the prevention and self-management of osteoporosis among post-menopausal women, while a single study from Iran examines the processes of seeking information and lifestyle changes [54]. To facilitate a clearer comparison, the results in Table 1 have been organized by continent, revealing both commonalities and significant differences in the experiences and challenges faced by people with osteoporosis.

A variety of methodological approaches and data collection can be found, as reported in Table 1: nonetheless, every choice made by the authors has resulted in being coherent with the purpose of the study and with the analysis of the result of each study.

The sample size varies considerably in each study, mostly depending on study setting, purpose and methods, ranging from 5 [38] to 78 [44] participants. Data on other sociodemographic characteristics, namely the age and sex of the samples, were also collected. Data that are not surprising are those on the sex of the samples: apart from two studies in which only a male sample was included, consistent with the study purpose [40,47], in all the remaining studies more than half of the sample was represented by women: in 21 studies, the percentage of women in the samples is ≥ 90 %, whereas in 14 studies this percentage rises to 100 %. Comprehensively, the total sample consists of 717 subjects, of whom 89.5 % ($n = 642$) are women.

3.3. Risk of bias in studies

The risk of bias was assessed using the JBI Critical Appraisal Tool for qualitative research [27], which includes ten specific criteria for evaluating the methodological quality of studies. As described in Table 2, all included studies demonstrated good methodological quality, with scores ranging from 80 % to 100 %.

Most studies showed strong congruence across key methodological elements (criteria I-V), including alignment between the stated philosophical perspective, research methodology, research questions, and the interpretation of results.

For criteria VI and VII, which assess the cultural or theoretical positioning of researchers and the reciprocal influence between researchers and the research process, some studies provided incomplete or unclear responses, represented as '?'. Specifically, criterion VI was met in 55.6 % of cases, while criterion VII was met in 44.4 % of cases.

Criterion VIII, which evaluates whether participants and their voices are adequately represented, was fully met by all studies (100 %). This reflects the consistent attention paid to accurately reporting participants' perspectives and ensuring their voices were a central component of the research findings.

All studies fully satisfied the ethical requirements (criterion IX), demonstrating compliance with current ethical standards and explicit approval from an appropriate ethics committee. Additionally, the conclusions drawn (criterion X) were consistently aligned with the analysis or interpretation of the data, indicating strong theoretical validity.

3.4. Results of individual studies

Data were synthesized following the theoretical framework of Riegel's middle-range theory of self-care [7]. For each study, the described behaviors were categorized according to their alignment with the dimensions of self-care maintenance, monitoring or management. Subsequently, specific subthemes within each dimension were identified. This approach facilitated the synthesis of findings in a theory-driven approach.

All the dimensions described by Riegel's middle range theory of self-

Table 1
Data extraction.

Author(s) (year)	Country	Aim(s)	Study design	Methodology for data collection/methodology for data analysis	Sample size (n)	Sample, women (%)	Sample, age: mean (M), range (R) or SD	Emerging themes	Main conclusions
<i>America</i>									
De Souza et al. (2010)	Brazil	To understand the interactional experience of individuals undergoing osteoporosis treatment and develop a representative theoretical model.	Qualitative study	Non-structured interviews/grounded theory, symbolic interactionism.	12	11 (92 %)	36–79 (R)	Phenomenon A. Self-evaluating Health Conditions According to Disease Signs Phenomenon B. Making a Decision About the Treatment With Wellbeing as a Goal	The experiences of individuals with osteoporosis undergo a cyclic movement between treatment relaxation and resumption aiming for wellbeing.
Wilkins (2001)	Canada	To identify the relationships between self-concept and the meanings of aging and chronic illness.	Qualitative study	In-depth interview and + self-administered questionnaire/constant comparative method [63]	28	28 (100 %)	54–80 (R)	Relative to self-concept, three groups of women were described: women with confident selves, women with contradictory selves and women with disparaged selves.	Acceptance was used by women with confident selves, denial by women with contradictory selves and resignation by women with disparaged selves.
Lau et al. (2008)	Canada	To explore the experiences and perceptions of postmenopausal women regarding strategies to improve adherence to osteoporosis therapy.	Qualitative, mixed phenomenologic study	Focus groups/code book to capture emerging themes	37	37 (100 %)	70 (M) 48–88 (R)	Belief in the importance of taking medication for osteoporosis, medication-specific factors, beliefs regarding medications and health, relationships with health care providers, information exchange, and strategies for improving adherence to medications.	Most notable factors that can detract from or facilitate adherence: relationships between patients and their health care providers, administration requirements and concerns about the adverse effects of medications, having systems or routines for taking medications, and being well informed about medications.
Sale et al. (2011)	Canada	To investigate patients' experiences with the decision to take prescribed OP medication.	Eidetic phenomenological study	Face-to-face semi-structured interviews/ Giorgi's methodology	21	15 (71 %)	65–88 (R)	Decision to take, or not take, OP	For over half of fracture patients, the decision to take OP medication was an easy one. Almost half of our patients with a fragility fracture who were deemed at high risk for another fracture reported finding the decision to take OP medication a 'difficult' one.
Beaton et al. (2012)	Canada	To understand the process by which patients decided whether to proceed with OP testing or care.	Qualitative study	Focus group/ constructivist grounded theory perspective	24	18 (75 %)	64.2 (M) 47–80 (R)	Common experience in the process; phases of awareness, appraisal, and action; essential elements of their pathway to OP testing and care	The main pathway is led by an awareness or "Aha!" moment followed by an action-oriented appraisal and related actions.
Sale et al. (2014)	Canada	To examine experiences and behaviors with bone health management post-fracture among members of a national osteoporosis patient group.	Qualitative study	Telephonic interviews/ Giorgi's procedures	28	26 (93 %)	51–89 (R)	Types of behaviors along an effective consumer continuum: "few" versus "many" effective consumer behaviors	Few effective consumer behaviors appeared to be receiving appropriate bone health management. Most members of an OP patient group engaged in many behaviors to navigate for bone health care.
Linton et al. (2020)	Canada	To examine patients' experiences with the booklet and to determine its influence on patients' beliefs and actions.	Qualitative study	Telephonic semi-structured interviews/ analytical hierarchical approach	50	48 (96 %)	58–89 (R)	Overall impression of the booklet when participants would have appreciated receiving the booklet reinforcement of what participants already know inspire	The booklet was viewed positively and appeared to reinforce what participants reported to already know about OP self-management. The booklet seemed to motivate participants

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Table 1 (continued)

Author(s) (year)	Country	Aim(s)	Study design	Methodology for data collection/methodology for data analysis	Sample size (n)	Sample, women (%)	Sample, age: mean (M), range (R) or SD	Emerging themes	Main conclusions
Yu et al. (2020)	Canada	To (i) examine perceptions of achieving calcium and vitamin D recommended dietary allowance (RDA) and (ii) determine how participants talked about food in relation to RDA recommendations.	Qualitative study	Telephone interviews/analytic hierarchical process	45	43 (95 %)	58–89 (R)	participants to take action, or to form intentions to take action. Perceptions of calcium intake were not clearly associated with achieving RDA levels; misunderstanding of a calcium-rich diet; participants focused on what they were not eating; vitamin D rarely mentioned in relation to a bone health diet;	to take actions or form intentions to perform new behaviors related to bone health. The majority of participants appeared to be able to achieve calcium and vitamin D RDAs, mostly through a reliance on supplements. The present study still demonstrated confusion in their understanding of a calcium-rich diet.
Ziebart et al. (2022)	Canada	To understand how participants integrate osteoporosis management advice into their lifestyle and the challenges they might face.	Qualitative study	In-depth interviews/data coding for major categories and themes	13	12 (92 %)	66 (M) 10.9 (SD)	Understanding fragility fractures and fall risk, knowledge acquisition, awareness of risks and opportunities, understanding the effect of exercise, challenges managing exercise expectations, attitude toward non-pharmacological management	Participants recognized the benefit of non-pharmacological management for managing osteoporosis, but sometimes found it difficult to integrate into their daily activities due to lack of time or knowledge.
Tibert et al. (2023)	Canada	To understand perceptions on rehabilitation after vertebral fracture, non-pharmacological strategies, and virtual care from the perspective of individuals living with vertebral fractures	Qualitative study	Semi-structured interviews online/thematic and content analysis from a post-positivism perspective	10	9 (90 %)	71 (M) 8 (SD)	Pain is the defining limitation of vertebral fracture recovery; delayed diagnosis impacts recovery trajectory; living with fear; being dissatisfied with fracture management; “getting back into the game of life” using non-pharmacological strategies	Participants reported back pain and an inability to perform activities of daily living, affecting psychological and social well-being. Physiotherapy, education, and exercise were considered helpful and important to patients; Participants believed that virtual rehabilitation was a feasible and effective but perceived some technology barriers.
Unson et al. (2003)	USA	To explore the roles of beliefs about medication and how they influence how women select a treatment	Qualitative study	Focus group discussions/open coding + selective coding	28 + 11 + 16 (N = 55)	55 (100 %)	74.8 (M) 1.1 (SD)	Medication adherence: (1) consequences of nonadherence and (2) beneficial effects of medication. Nonadherence: (1) lack of trust in medications, (2) doubts about physicians' competence, (3) proactive patient behaviors, and (4) other reasons.	African American women felt less susceptible to fractures and osteoporosis than Hispanic or European American women. The Hispanic women appeared to be influenced more by media and word-of-mouth than other participants.
Jachna and Forbes-Thompson (2005)	USA	To describe residents' perceptions of osteoporosis and barriers to treatment in an assisted living setting (ALF).	Exploratory qualitative design	Semi-structured interviews/qualitative content analysis.	5	5 (100 %)	84 (M) 71–93 (R)	Residents' health beliefs: Residents' perceptions of osteoporosis Barriers and benefits to osteoporosis treatment	The ALF is potentially an ideal environment to help address their knowledge deficits gradually over time and to provide ongoing interventions to promote behaviors beneficial to osteoporosis.
Brod et al. (2008)	USA	To understand compliance issues for long term self-injectable treatments.	Qualitative study	Semi-structured interview and 2 focus groups/analysis for common themes and	22	21 (100 %)	42–88 (R) 72 (M)	Precursor factors influencing compliance Decision to initiate treatment Factors influencing short-term compliance (the first month of	Physician and patient factors influence the compliance process and that there are four distinct decision points that influence compliance behavior.

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Table 1 (continued)

Author(s) (year)	Country	Aim(s)	Study design	Methodology for data collection/methodology for data analysis	Sample size (n)	Sample, women (%)	Sample, age: mean (M), range (R) or SD	Emerging themes	Main conclusions
				generation of a conceptual model.				treatment) Factors influencing long-term persistence (from one month to end of recommended treatment) Factors influencing adherence	Key patient factors were: patient motivation and initial expectations about treatment. Factors that influence adherence differ from factors that influence persistence.
Mazor et al. (2010)	USA	To explore older women's views about prescription osteoporosis medications and to identify beliefs and experiences.	Qualitative study	In-depth telephone interviews/transcripts' coding	36	36 (100 %)	73.4 (M) 6.2 (SD)	Women's beliefs and experiences core beliefs, their interactions with their physician, their own personal experience/health behaviors, or to vicarious experience	While some women fully trust their physician's recommendations, others are skeptical about medications. Many women are concerned about side effects. Patients may not always voice their confusion or express their reservations about recommendations.
Solimeo et al. (2011)	USA	To explore the nature of men's experiences of osteoporosis by developing an understanding of men's explanatory models.	Qualitative study	Semistructured interviews/explanatory model construct and content coding	23	0 (0 %)	53–86 (R) 70.36 (M)	Men's explanatory models which illustrate their beliefs.	Men demonstrated limited clinical knowledge of osteoporosis and fracture risk factors. They highlight limitations to the current health care approach to osteoporosis in men as well as indicate the ways in which masculinity influences their health-related behavior.
<i>Asia</i> Ansari et al. (2021)	Iran	To assess health information-seeking and self-care behaviors of women with osteoporosis in Iran.	qualitative study	Semi-structured interview/contractual content analysis	15	15 (100 %)	58–85 (R)	Knowledge gaps; established networking for seeking information; information from trust to distrust; information-seeking inhibiting factors; self-care behaviors based on required knowledge; information-seeking facilitating factors	Patients who spent less time since the onset of diseases had more questions in their minds, indicating the importance of information during this period. Importance of paying attention to different dimensions of physical, mental, social, spiritual, cognitive, and family needs in the field of care information
<i>Europe</i> Baert et al. (2015)	Belgium	To identify motivators for and barriers to PA (Physical Activity) specifically in OPWO (older patients with osteoporosis).	Qualitative study	Focus groups/thematic analysis	15	10 (66 %)	68–82 (R)	15 different motivators and 18 different barriers. Intrapersonal, interpersonal, and community levels.	Health improvement, social contact, habit, feeling good, and receiving medical advice from a doctor are motivators for PA. Pain, fear of falling, bad weather, lack of interest in PA, and providing care to an ill partner were reported as barriers to PA.
Nielsen et al. (2011)	Denmark	To develop an understanding of how men experience having osteoporosis and handle	Qualitative study	Focus group interviews/ Meaning condensation	16	0 (0 %)	51–82 (R)	The importance of being active Acting on a need for help Social context of osteoporosis	Men handle osteoporosis in different ways and preferred life activities as well as the level of health. Health professionals

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Table 1 (continued)

Author(s) (year)	Country	Aim(s)	Study design	Methodology for data collection/methodology for data analysis	Sample size (n)	Sample, women (%)	Sample, age: mean (M), range (R) or SD	Emerging themes	Main conclusions
		osteoporosis in their everyday lives.						Relations with other patients and professionals	working with men who have osteoporosis must realize that men find it important to maintain physical activity.
Hansen et al. (2017)	Denmark	To explore women's experiences of living with osteoporosis in the first year after diagnosis.	Longitudinal qualitative study	Narrative qualitative interviews/phenomenological-hermeneutic approach	15	15 (100 %)	65–79 (R) 71.9 (M)	Two key themes: 1) "to become influenced by the medical treatment" 1. "daily life with osteoporosis".	The process is highly influenced by finding strategies that encompass taking the medication, side effects or concerns about side effects, the acceptance and interpretation of scan results, symptoms and the diagnosis, as well as decision-making.
Alami et al. (2016)	France	To explore the patients' and practitioners' views regarding post menopausal osteoporosis (PMO) and to identify potential improvements in medical care strategies.	Qualitative study	Face-to-face semi-structured interviews/inductive thematic analysis	37	37 (100 %)	67 (M) 55–87 (R)	Women's views concerning PMO symptoms.	Our study confirmed the importance of the uncertainty of the relation between fractures and osteoporosis, for the women and for some physician.
Swart et al. (2018)	Netherlands	To gain insight into the considerations concerning intentional non-initiation of bisphosphonate treatment.	Qualitative study	Face-to-face semi-structured interviews/open coding	26	22 (85 %)	76.3 (M)	Insufficient medical advice, attitudes toward medication, concerns about side effects, disease awareness.	The fear of side effects was an important issue among non-starters. Starters were aware of the possibility of side effects, but this did not discourage them from starting the treatment. Most of the factors of non-initiation were comparable to the factors that play a role in non-adherence in general.
Dohm et al. (2016)	Norway	To describe perceptions and experiences of physical activity (PA) and the factors that influence habitual PA among older adults with osteoporosis, impaired balance, and fear of falling.	Qualitative study	Semistructured interviews/interpretive content analysis with an inductive approach	18	18 (100 %)	76.5 (M) 66–86 (R)	Overall theme: - Physical Activity—A Tool for Staying Healthy With Osteoporosis Main themes: - Being physically active with osteoporosis means having to face challenges - Being physically active gives possibilities to maintain health	Older women with osteoporosis have a positive attitude toward PA. Most women had adapted to disease-specific limitations and developed strategies to overcome challenges and barriers to PA.
McKenna and Ludwig (2008)	UK	To shed light on the experiences of both osteoporotic Caucasian and South Asian women during their General Practitioner (GP) consultations.	Qualitative study	Semi-structured interviews/hermeneutic phenomenology	21	21 (100 %)	43–82 (R)	GPs' care recommendations as perceived by these Caucasian and South Asian women with diagnosed OP.	Women of all ages looked to their GP for support in managing their OP. The lack of discussion may lead to patients feeling that their GPs don't understand. Older women holding less positive attitudes toward self-care and having a stronger reliance on the GP
Besser et al. (2012)	UK	To explore how osteoporosis patients view their illness, to identify what beliefs they hold	Qualitative study	Semi-structured interviews and patients' drawings/coding	14	14 (100 %)	69 (M) 10.1 (SD)	Identity; cause; timeline; controllability; cure; consequences; emotions; risk;	(1) Some patients are unaware that osteoporosis medication can reduce the risk of fracture; (2)

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Table 1 (continued)

Author(s) (year)	Country	Aim(s)	Study design	Methodology for data collection/methodology for data analysis	Sample size (n)	Sample, women (%)	Sample, age: mean (M), range (R) or SD	Emerging themes	Main conclusions
		about their illness and medication and to identify how they view their fracture risk.		framework and drawings analysis				perceptions; severity; susceptibility; medication beliefs; adherence; recommendations for adherence; relationships.	drawings/images of osteoporosis may arouse emotions in patients and could be used to help them to understand the seriousness of the condition; (3) some patients have limited knowledge/ideas about the causes of their condition; (4) there is confusion and uncertainty about how/whether the condition can be controlled and (5) patients who do not attend clinic appointments may be at particular risk of medication non-adherence.
Salter et al. (2014)	UK	To describe key perceptions that influence older women's adherence and persistence with prescribed medication.	Longitudinal qualitative study	Interviews/framework analysis	30	30 (100%)	73–85 (R)	Understanding adherence and non-adherence Motivations, self-care and adherence Appraising and prioritizing risk Anticipating and managing side effects Problems of understanding Decision making around medication	The data overall show a group of resilient older women doing their best to make sense of a particular set of health opportunities in their lives, and keen to manage the impacts of aging and minimize increasing frailty and dependence.
Narayanasamy et al. (2022)	UK	To provide insight into the acceptability and engagement of both oral and intravenous bisphosphonate treatments for patients with osteoporosis who were at risk of fragility fractures.	Qualitative study	Telephonic semi-structured interviews/iterative categorization + theoretical framework of acceptability (TFA)	78	73 (94%)	69.9 (M)	Intervention coherence and perceived effectiveness Opportunity costs and burden Ethicality Self-efficacy and affective attitude	Annual intravenous zoledronate bisphosphonate treatment was generally more acceptable to patients. Patients' acceptability and engagement in bisphosphonate treatment can be described and explained through the seven TFA domains
<i>Oceania</i> Barcenilla-Wong et al. (2020)	Australia	To determine what post-menopausal Australian women know about osteoporosis and osteoporosis prevention.	Qualitative study	Focus group sessions/thematic analysis	23	23 (100%)	67 (M) 5.6 (SD)	Ambiguity about the nature of osteoporosis, ambiguity about osteoporosis prevention and reluctance to take anti-osteoporosis medications.	Ambiguity can influence self-management and osteoporotic prevention behaviors in post-menopausal Australian women. Ambiguity may provide post-menopausal women with a false sense of security that they are adequately acting to prevent osteoporotic disease.

Table 2
Results of the risk of bias/quality assessment.

	Criterion										Ratio
	I	II	III	IV	V	VI	VII	VIII	IX	X	
Wilkins [30]	+	+	+	+	+	?	-	+	+	+	80 %
Unson et al. [41]	+	+	+	+	+	+	?	+	-	+	80 %
Jachna and Forbes-Thompson [38]	+	+	+	-	+	+	-	+	+	+	80 %
Lau et al. [29]	+	+	+	+	+	-	+	+	+	+	90 %
McKenna and Ludwig [43]	+	+	+	+	+	?	?	+	+	+	80 %
Brod et al. [37]	+	+	+	+	+	-	-	+	+	+	80 %
de Souza et al. [49]	+	+	+	+	+	+	-	+	+	+	90 %
Mazor et al. [39]	+	+	+	+	+	-	?	+	+	+	80 %
Nielsen et al. [47]	+	+	+	+	+	+	?	+	+	+	90 %
Solimeo et al. [40]	+	+	+	+	+	+	+	+	+	+	100 %
Sale et al. [28]	+	+	+	+	+	-	-	+	+	+	80 %
Beaton et al. [31]	+	+	+	+	+	+	+	+	+	+	100 %
Besser et al. [45]	+	+	+	+	+	+	-	+	+	+	90 %
Salter et al. [42]	+	+	+	+	+	-	+	+	+	+	90 %
Sale et al. [32]	+	+	+	+	+	+	+	+	+	+	100 %
Baert et al. [53]	+	+	+	+	+	+	?	+	+	+	90 %
Alami et al. [52]	+	+	+	+	+	+	+	+	+	+	100 %
Dohrn et al. [51]	+	+	+	+	+	-	+	+	+	+	90 %
Hansen et al. [46]	+	+	+	+	+	+	+	+	+	+	100 %
Swart et al. [50]	+	+	+	+	+	-	-	+	+	+	80 %
Barcenilla-Wong et al. [48]	+	+	+	+	+	-	?	+	+	+	80 %
Linton et al. [33]	+	+	+	+	+	-	+	+	+	+	90 %
Yu et al. [34]	+	+	+	+	+	-	?	+	+	+	80 %
Ansari et al. [54]	+	+	+	+	+	+	+	+	+	+	100 %
Ziebart et al. [35]	+	+	+	+	+	+	+	+	+	+	100 %
Narayanasamy et al. [44]	+	+	+	+	+	+	-	+	+	+	90 %
Tibert et al. [36]	+	+	+	+	+	+	+	+	+	+	100 %
Ratio	100 %	100 %	100 %	96.3 %	100 %	55.6 %	44.4 %	100 %	96.3 %	100 %	

Note: + = Yes; - = Not; ? = unclear.

Criterion/items: I. Is there congruity between the stated philosophical perspective and the research methodology? II. Is there congruity between the research methodology and the research question or objectives? III. Is there congruity between the research methodology and the methods used to collect data? IV. Is there congruity between the research methodology and the representation and analysis of data? V. Is there congruity between the research methodology and the interpretation of results? VI. Is there a statement locating the researcher culturally or theoretically? VII. Is the influence of the researcher on the research, and vice-versa, addressed? VIII. Are participants, and their voices, adequately represented? IX. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body? X. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?

care [7] emerge in the selected studies. The lived experiences of self-care retrieved in the studies touched several aspects of the dimensions of self-care and are distributed as follows: 25 studies outline aspects related to self-care maintenance, 13 to self-care monitoring and 15 to self-care management; Table 3 illustrates this distribution. For every main dimension of self-care, several subthemes were identified. This implication represents a key step in identifying the specific aspects of the self-care experience in osteoporosis: while the aspects of monitoring, maintenance and management are the broad framework for chronic diseases, the identification of these subthemes helps the researcher to better understand the specific self-care experience in osteoporosis. A detailed graphical description of the subthemes can be found in Tables 4, 5 and 6 respectively related to self-care maintenance, self-care monitoring and self-care management.

3.4.1. Self-care maintenance

With regard to self-care maintenance, which is the most addressed self-care dimension, seven subthemes were identified. The articles in this section are mostly related to the theme of pharmacological treatment: in particular, factors related to adherence and non-adherence to therapy have been explored by 12 authors [28,29,31,32,37-41,44-46] and, in addition, aspects related to patients' attitude toward therapy have been reported by eleven authors [29,32,36,37,39,41-44,48,52]. Aside from therapy, many self-care maintenance behaviors have been listed, such as diet and dietary recommendations [33-35,38,42,46,48,52], aspects related to physical activity [33,35,38,40,42,46-48,51-53] and lifestyle changes, especially associated with the establishment of new routines [32,50,54] and reduction of the risk of fractures [31,35,45,52]. Finally, it appeared that all these aspects, and more generally self-care maintenance, can be strongly

influenced by the relationship with healthcare professionals, as mentioned by three authors [29,39,43].

3.4.2. Self-care monitoring

With regard to self-care monitoring, a dimension that has emerged less than the two others, four subthemes were detected. Two subthemes are related to the world of diagnostic and instrumental tests: specifically, several authors directly mentioned these tests as instruments to actively monitor the disease evolution [31,32,39,42,43,45] while four also reported aspects related to the interpretation of these tests, which can be crucial for therapy adherence [31,39,40,44]. Still referring to self-care monitoring, a further aspect that emerges is the detection and perception of symptoms, as described by six authors [40,46,49-52]. Eventually, also in this dimension of self-care but with a different nuance of meaning, the relationship with professionals was reported, mainly related to the interpretation of the results of clinical tests and evolution of the disease [31,32,44].

3.4.3. Self-care management

Four subthemes emerged for the dimension of self-care management, addressed by 15 authors. Symptoms and disease management have been mentioned by six authors, explaining the most characterizing aspects of this dimension of self-care [30,36,40,46,47,54]. In addition, proactive actions for management were also identified, helping to report a concrete picture with regard to the actions taken by patients for management of the disease [32,33,35,46,49,51]. Finally, the remaining authors who addressed this dimension of self-care helped to identify the two remaining subthemes, namely medication management [37,44] and barriers and facilitators in management [31,43].

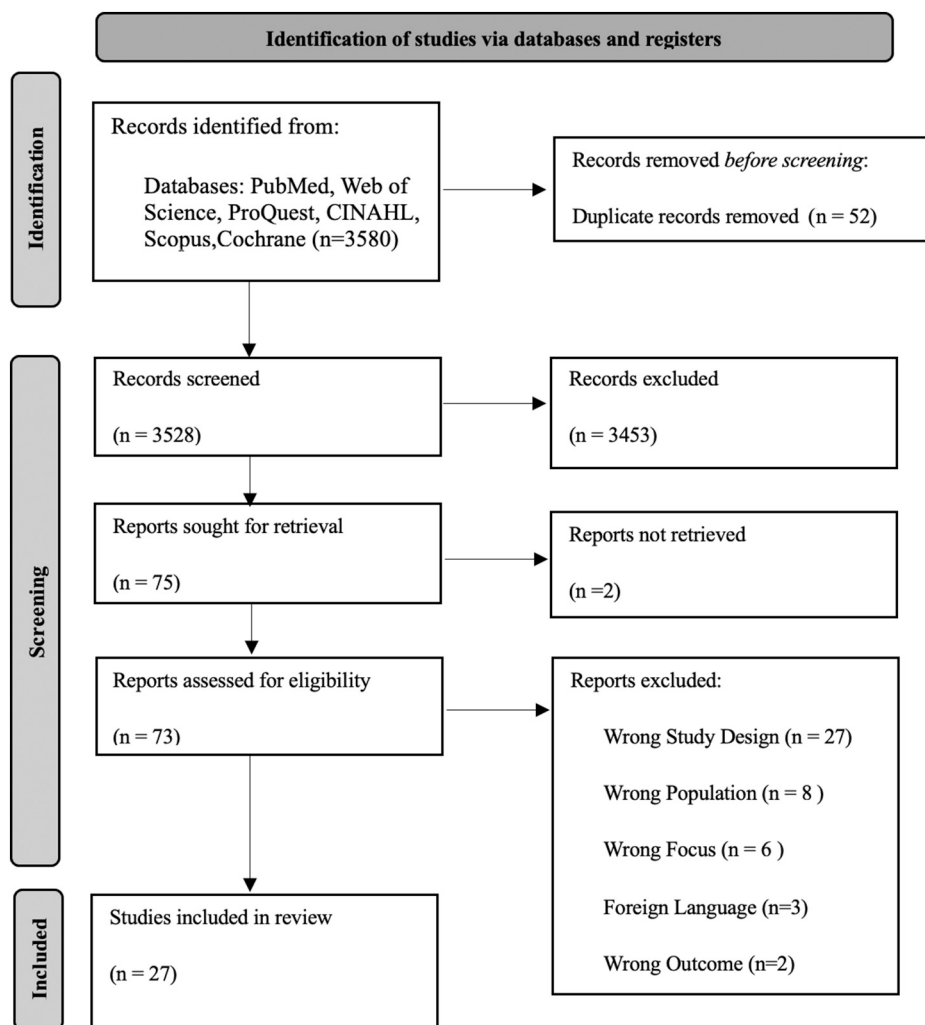


Fig. 1. PRISMA flowchart.

4. Discussion

Exploring self-care is essential to better understand the daily experience of patients in all dimensions of self-care regarding osteoporosis. Understanding how self-care maintenance, monitoring and management of osteoporosis, often referred to as a ‘silent’ illness, allow the experience of the illness to be considered and also how to promote proper health maintenance practices.

The results are probably influenced by the geo-cultural context, since, from a continental distribution point of view, distinct regional trends emerge and the results reveal marked regional disparities in research focus, representation, and thematic breadth. Indeed, this geographic distribution underscores the dominance of research from Anglo-Saxon countries (particularly in Canada [28–36], the USA [37–41], and the UK [42–45]), potentially limiting the global applicability of findings. The absence of studies from Africa and much of Asia, with the exception of the Iranian study [54], highlights significant gaps in understanding osteoporosis self-care in these regions. Meanwhile, European research [42–47,50–53], although diverse, still reflects limited representation from eastern and southern Europe, often emphasizing preventive approaches alongside pharmacological interventions. Thematic variations are also evident. North American studies [28–41] prioritize medication adherence and patient attitudes, whereas European research [46,47,50–53] spans broader areas, including experiential and lifestyle dimensions. These findings suggest an urgent need for expanded research in underrepresented geographical

and cultural contexts to achieve a more comprehensive understanding of osteoporosis self-care worldwide, since the research landscape is heavily skewed toward English-speaking countries, leaving vast non-Western cultural and geographical contexts largely uncharted.

Consistent with the literature and the epidemiology of the disease, the largest part of the sample is represented by women, confirming that osteoporosis manifests itself predominantly according to sex. However, osteoporosis also affects men, even though it is less widespread. In our review, only 2 out of 27 studies collect experiences from purely male samples [40,47]. As reported by the authors, the direct translation of knowledge and prevention strategies from the general osteoporosis approach (mostly linked to the “female framework”) is insufficient [47], as affirmed also by a recent review claiming that focus of osteoporosis as a women’s disease may influence how men develop self-management strategies [55]. More research should indeed be conducted to guarantee a better understanding of osteoporosis in men.

As previously reported, all included studies show a low risk of bias and good methodological quality, according to the JBI Critical Appraisal Tool for Qualitative Research [27] which means that none of the articles included in the final selection according to the PRISMA flowchart [24] were excluded due to poor methodological quality and that the information obtained from the articles and discussed here is reliable and qualitatively valid. For this reason, the information contained in the articles is considered reliable for building a picture of self-care behaviors and osteoporosis experiences. Moreover, the majority of studies exhibited strong alignment across key methodological aspects, ensuring

Table 3
Dimensions of self-care addressed by each study.

Author(s) (year)	Self-care maintenance	Self-care monitoring	Self-care management
Wilkins (2001)			+
Unson et al. (2003)	+		
Jachna and Forbes-Thompson (2005)	+		
Lau et al. (2008)	+		
McKenna and Ludwig (2008)	+	+	+
Brod et al. (2008)	+		+
de Souza et al. (2010)		+	+
Mazor et al. (2010)	+	+	
Nielsen et al. (2011)	+		+
Solimeo et al. (2011)	+	+	+
Sale et al. (2011)	+		
Beaton et al. (2012)	+	+	+
Besser et al. (2012)	+	+	
Salter et al. (2014)	+	+	
Sale et al. (2014)	+	+	+
Baert et al. (2015)	+		
Alami et al. (2016)	+	+	
Dohrn et al. (2016)	+	+	+
Hansen et al. (2017)	+	+	+
Swart et al. (2018)	+	+	
Barcenilla-Wong et al. (2020)	+		
Linton et al. (2020)	+		+
Yu et al. (2020)	+		
Ansari et al. (2021)	+		+
Ziebart et al. (2022)	+		+
Narayanasamy et al. (2022)	+	+	+
Tibert et al. (2023)	+		+

Note: + = discussed.

consistency in research design, questions, and data interpretation. Some studies, however, showed gaps in addressing the cultural or theoretical positioning of researchers. Nonetheless, all studies successfully met

Table 4
Subthemes of self-care maintenance and related authors.

Author(s) (year)	Adherence/non adherence to therapy	Attitudes toward therapy	Relationship with healthcare professionals	Diet	Physical activity	Fracture risk reduction	Lifestyle changes
Unson et al. (2003)	+	+					
Jachna and Forbes-Thompson (2005)	+			+	+		
Lau et al. (2008)	+	+	+				
McKenna and Ludwig (2008)		+	+				
Brod et al. (2008)	+	+					
Mazor et al. (2010)	+	+	+				
Nielsen et al. (2011)					+		
Solimeo et al. (2011)	+				+		
Sale et al. (2011)	+						
Beaton et al. (2012)	+					+	
Besser et al. (2012)	+					+	
Salter et al. (2014)		+		+	+		
Sale et al. (2014)	+	+					+
Baert et al. (2015)					+		
Alami et al. (2016)		+		+	+	+	
Dohrn et al. (2016)					+		
Hansen et al. (2017)	+			+	+		
Swart et al. (2018)							+
Barcenilla-Wong et al. (2020)		+		+	+		
Linton et al. (2020)				+	+		
Yu et al. (2020)				+			
Ansari et al. (2021)							+
Ziebart et al. (2022)				+	+		
Narayanasamy et al. (2022)	+	+		+	+	+	
Tibert et al. (2023)		+					
	12	11	3	8	11	4	3

Note: + = discussed.

ethical standards, and the voices of participants were consistently represented, underscoring the research’s commitment to accurately reflecting their perspectives in the findings.

Table 5
Subthemes of self-care monitoring and related authors.

Author(s) (year)	Diagnostic and instrumental tests	Perception of symptoms and risks	Interpretation of test results	Relationship with healthcare professionals
McKenna and Ludwig (2008)	+			
de Souza et al. (2010)		+		
Mazor et al. (2010)	+		+	
Solimeo et al. (2011)		+	+	
Beaton et al. (2012)	+		+	+
Besser et al. (2012)	+			
Salter et al. (2014)	+			
Sale et al. (2014)	+			+
Alami et al. (2016)		+		
Dohrn et al. (2016)		+		
Hansen et al. (2017)		+		
Swart et al. (2018)		+		
Narayanasamy et al. (2022)			+	+
	6	6	4	3

Note: + = discussed.

Table 6
Subthemes of self-care management and related authors.

Author(s) (year)	Medication management	Proactive actions for management	Symptoms and disease management	Barriers and facilitators in management
Wilkins (2001)			+	
McKenna and Ludwig (2008)				+
Brod et al. (2008)	+			
de Souza et al. (2010)		+		
Nielsen et al. (2011)			+	
Solimeo et al. (2011)			+	
Beaton et al. (2012)				+
Sale et al. (2014)		+		
Dohrn et al. (2016)		+		
Hansen et al. (2017)		+	+	
Linton et al. (2020)		+		
Ansari et al. (2021)			+	
Ziebart et al. (2022)		+		
Narayanasamy et al. (2022)	+			
Tibert et al. (2023)			+	
	2	6	6	2

Note: + = discussed.

As previously stated, the most addressed dimension of self-care in this review is self-care maintenance. The aspects concerning therapy, related to self-care maintenance, are those that emerge the most: patients affirm that proper adherence to pharmacological therapy is positively influenced by fear of the unpleasant consequences of the disease (such as fractures and worsening), by perceived efficacy over time, by expectations of an improvement in the disease and by the creation of daily routines [29,31,37,41,44]. On the other hand, factors that could determine a discontinuation of therapy or poor adherence are the presence or fear of gastrointestinal side effects and the occurrence of unpredictable effects [29,36,39–41,44]. To maintain osteoporosis stability, patients also adopt strategies to mitigate risks and avoid falls: to illustrate, fear of falling involves the implementation of new strategies, applied in patients' home environment and outside [35,45,52,54]. The diet also represents an aspect of self-care maintenance, since a daily calcium intake between 800 and 1200 mg and sufficient dietary protein (ideally achieved through dairy products) are recommended [56,57]. Calcium and Vitamin D intake were mentioned in several articles of this review as an important aspect of maintaining bone health [33–35,42,46,48,52].

Furthermore, the importance of physical activity was recognized and emphasized in several articles. According to patients, exercises such as walking, jogging, swimming, aqua aerobics and stretches contribute to maintaining range of motion, flexibility and preventing the evolution of osteoporosis [33,35,38,40,42,46,48,52,53].

However, patients often express confusion and dissatisfaction with the information they are given about such self-care maintenance behaviors due to contrasting or incomplete information [29,43,48,51]. In this respect, a key role is played by health professionals: unmet information needs appear to have psychosocial consequences and result in poor treatment adherence [58]. In the present review, patients highlighted their preference for more information from their doctors and

wanted to prolong discussions about self-care maintenance behaviors throughout subsequent consultations [28,29,35,37,39,41,43]. These aspects are echoed in a review by Alvaro et al. [21], focused on self-care maintenance: this shows how indeed all the aspects mentioned with respect to therapeutic adherence and healthy lifestyles can be positively influenced by educational and supportive, patient-tailored interventions led by health professionals, specifically by specially trained bone care nurses [59,60].

Healthcare professionals are also strongly influential in self-care monitoring. The results show a need for correct interpretation and explanation of clinical test results made by clinicians (such as dual-energy X-ray absorptiometry and bone mineral density scanning) because several patients use them to understand the stage and progression of the disease and to verify the effectiveness of therapy and of self-care behaviors [31,32,39,40,42–46].

To monitor the evolution of the disease, it is also fundamental to recognize symptoms: poor perception of symptoms in osteoporosis can lead to less awareness of risk and suboptimal adherence to treatments [48]. Patients recognized symptoms such as pain, fractures, changes in spine curvature, height loss, reduced flexibility, brittle bones and disability, and usually interpreted their presence as a consequence and as evolution of the disease [40,45,46,49,51,52].

The presence of symptoms also leads to their control through the dimension of self-care management. Specifically, the most addressed symptom is pain, which is controlled by painkillers but also by physical activity and physiotherapy, massage, spinal orthotics, supine lying, heat and transcutaneous electrical nerve stimulation [36,40,47,54]. With the appearance of fractures and related symptoms, it was found that more management behaviors are implemented, and a more proactive attitude is developed [43,49]. Other proactive measures include actions such as personal strategies to cope with symptoms and the therapy regimen, to better understand the condition, to make concrete changes in daily routines in order to adapt life to osteoporosis, to take special measures to perform certain activities and to take measures to restore wellbeing [32,33,44,46,49,51]. These proactive measures often occur alongside some barriers and facilitators: the authors reported a lack of clarity on the steps to take and the existence of knowledge gaps [31,54] as barriers, whereas family support, good medical guidance and supporting materials such as informative booklets were reported as facilitators [33,37,43,53]. In summary, it emerges that self-care management behaviors and proactive actions combined with good self-motivation are the basis for many patients believing that they can cope with the disease and associated changes [30,35].

The strength of our work lies in the compilation of an in-depth and current overview of >20 years of self-care experiences in the context of osteoporosis, something that has not been addressed in the literature to date. This review enables us to explore and understand the experiences of patients with osteoporosis according to the middle-range theory of self-care [7], which perfectly adapts to chronic diseases, allowing an in-depth identification of how self-care elements and behaviors are distributed within the three dimensions of *maintenance*, *monitoring* and *management*. At the level of clinical implication, in addition to providing a better understanding of disease experiences, this review may represent a first step toward the creation of specific instruments capable of measuring levels of self-care in this population and a chance to implement patient- and disease-specific interventions.

4.1. Limitations

This meta-synthesis has several limitations. First, the study results are largely derived from the Anglo-Saxon context, especially Canada, and provide the experience of a unified context, excluding Asia and Africa, without giving a global overview. Another limitation is represented by the fact that relevant articles produced in the most recent months may have been excluded because the last database search was dated June 2023. Finally, we recognize that Riegel's middle-range

theory on self-care [7] was not taken as a reference in the selected studies, so bias may therefore exist as to interpretation, collection and aggregation of the extrapolated elements by the investigators.

5. Conclusions

Obtaining a comprehensive and up-to-date overview of this topic allows healthcare professionals to understand the experience of patients, thus laying the groundwork for developing specific tools to measure levels of self-care and implement more patient- and disease-specific interventions. A concrete example of this could be the implementation, strengthening, and further development of the Self-Care of Osteoporosis Scale (SCOS) [23], a specific scale for self-care in osteoporosis which would allow the aspects of self-care typical of osteoporosis to be explored, as reported in this review.

On the whole, it is not surprising to see how, for a 'silent disease' such as osteoporosis, the self-care behaviors that most emerge are linked to the dimension of self-care maintenance: most of the articles report aspects related to maintaining the stability of the disease and avoiding its progression, in particular through adherence to therapy, adoption of a specific diet, encouragement of physical activity and strategies for reducing the risks linked to falls. In this regard, it is acknowledged that it is, however, a dimension that needs to be further investigated and incentivized because smoking cessation, for example, which is a strongly recommended aspect of self-care maintenance, is not mentioned in any study. Educational interventions related to self-care should therefore be implemented and led by specifically trained healthcare professionals, in particular nurses, as confirmed in the literature [21,59–62], especially with regard to the provision of disease-specific information, which often resulted incomplete and unclear. More education with respect to self-care behaviors could therefore contribute to the empowerment of patients and consequently to an improvement of their quality of life: maintaining proactive self-care attitudes could grant patients a more stable and controllable life with osteoporosis.

Contributors

Chiara Tedesco contributed to concept and design, data collection, data analysis and interpretation, drafting, and critical revision of the paper.

Vicente Bernalte-Martí, contributed to concept and design, data collection, data analysis and interpretation, drafting, and critical revision of the paper.

Gianluca Pucciarelli contributed to concept and design, data analysis and interpretation, drafting, and critical revision of the paper.

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Annalisa Pennini contributed to concept and design, and critical revision of the paper.

Umberto Tarantino contributed to concept and design, and critical revision of the paper.

Rosaria Alvaro contributed to concept and design, and critical revision of the paper.

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Declaration of competing interest

The authors declare that they have no competing interest.

References

- [1] K.E. Ensrud, C.J. Crandall, Osteoporosis, *Ann. Intern. Med.* 167 (3) (Aug. 2017) ITC17–ITC32, <https://doi.org/10.7326/AITC201708010>.
- [2] E. Hemmati, M. Mirghafourvand, M. Mobasser, S.K. Shakouri, P. Mikaeli, A. Farshbaf-Khalili, Prevalence of primary osteoporosis and low bone mass in postmenopausal women and related risk factors, *J. Educ. Health Promot.* 10 (2021) 204, <https://doi.org/10.4103/jehp.jehp.945.20>.
- [3] J.A. Kanis, et al., SCOPE 2021: a new scorecard for osteoporosis in Europe, *Arch. Osteoporos.* 16 (1) (Jun. 2021) 82, <https://doi.org/10.1007/s11657-020-00871-9>.
- [4] J.A. Kanis, C. Cooper, R. Rizzoli, J.-Y. Reginster, Scientific Advisory Board of the European Society for Clinical and Economic Aspects of Osteoporosis (ESCEO) and the Committees of Scientific Advisors and National Societies of the International Osteoporosis Foundation (IOF), European guidance for the diagnosis and management of osteoporosis in postmenopausal women, *Osteoporos. Int.* 30 (1) (Jan. 2019) 3–44, <https://doi.org/10.1007/s00198-018-4704-5>.
- [5] C.B. Johnston, M. Dagar, Osteoporosis in older adults, *Med. Clin. North Am.* 104 (5) (Sep. 2020) 873–884, <https://doi.org/10.1016/j.mcna.2020.06.004>.
- [6] M. Dziedzic, M. Janiszewska, M. Goździewska, W. Kowalska, J. Roliński, Assessment of the quality of life of women after osteoporotic vertebral fracture with consideration of socio-demographic characteristics and selected factors concerning the state of health, *Int. J. Environ. Res. Public Health* 19 (19) (Sep. 2022), <https://doi.org/10.3390/ijerph191912237>.
- [7] B. Riegel, T. Jaarsma, A. Strömberg, A middle-range theory of self-care of chronic illness, *ANS Adv. Nurs. Sci.* 35 (3) (2012) 194–204, <https://doi.org/10.1097/ANS.0b013e318261b1ba>.
- [8] B. Riegel, T. Jaarsma, C.S. Lee, A. Strömberg, Integrating symptoms into the middle-range theory of self-care of chronic illness, *ANS Adv. Nurs. Sci.* 42 (3) (2019) 206–215, <https://doi.org/10.1097/ANS.0000000000000237>.
- [9] E. Mehraeen, M. Mehrtak, N. Janfaza, A. Karimi, M. Heydari, P. Mirzapour, A. Mehranfar, Design and development of a mobile-based self-care application for patients with type 2 diabetes, *J. Diabetes Sci. Technol.* 16 (4) (2022) 1008–1015, <https://doi.org/10.1177/19322968211007124>.
- [10] E. Mehraeen, R. Safdari, N. Mohammadzadeh, S.A. Seyedalinaghi, S. Foroootan, M. Mohraz, Mobile-based applications and functionalities for self-management of people living with HIV, *Stud. Health Technol. Inform.* 248 (2018) 172–179 (PMID: 29726434).
- [11] M. Di Nitto, et al., Self-care behaviors in patients with cancer treated with oral anticancer agents: a systematic review, *Support Care Cancer* 30 (10) (Oct. 2022) 8465–8483, <https://doi.org/10.1007/s00520-022-07166-4>.
- [12] B. Bassola, M. Lusignani, Self-care in people with motor neuron disease: an integrative review, *J. Neurosci. Nurs.* 49 (5) (Oct. 2017) 311–317, <https://doi.org/10.1097/JNN.0000000000000303>.
- [13] S. Krzemińska, K. Lomper, A. Chudiak, D. Ausili, I. Uchmanowicz, The association of the level of self-care on adherence to treatment in patients diagnosed with type 2 diabetes, *Acta Diabetol.* 58 (4) (Apr. 2021) 437–445, <https://doi.org/10.1007/s00592-020-01628-z>.
- [14] B. Riegel, et al., Self-care for the prevention and management of cardiovascular disease and stroke, *J. Am. Heart Assoc.* 6 (9) (Sep. 2017), <https://doi.org/10.1161/JAHA.117.006997>.
- [15] N. Kolac, A. Yıldız, The effect of health belief model-based short interviews in women in the postmenopausal period on the prevention of osteoporosis: a randomized controlled trial, *Int. J. Nurs. Pract.* 29 (1) (Feb. 2023) e13121, <https://doi.org/10.1111/ijn.13121>.
- [16] Y. El Miedany, M. Toth, W. Elwakil, S. Saber, Post-fracture care program: pharmacological treatment of osteoporosis in older adults with fragility fractures, *Curr Osteoporos Rep* (Jun. 2023), <https://doi.org/10.1007/s11914-023-00791-w>.
- [17] E. Hesari, et al., Osteoporosis medication adherence tools: a systematic review, *Osteoporos. Int.* (Jun. 2023), <https://doi.org/10.1007/s00198-023-06789-5>.
- [18] F. Migliorini, G. Vecchio, C.D. Weber, D. Kämmer, A. Bell, N. Maffulli, Management of transient bone osteoporosis: a systematic review, *Br. Med. Bull.* (Jun. 2023), <https://doi.org/10.1093/bmb/ldad012>.
- [19] S. Nayak, S.L. Greenspan, How can we improve osteoporosis care? A systematic review and meta-analysis of the efficacy of quality improvement strategies for osteoporosis, *J. Bone Miner. Res.* 33 (9) (Sep. 2018) 1585–1594, <https://doi.org/10.1002/jbmr.3437>.
- [20] A.J. Rose, S.L. Greenspan, G.K. Jasuja, Gaps in evidence on treatment of male osteoporosis: a research agenda, *Aging Male* 26 (1) (Dec. 2023) 2223699, <https://doi.org/10.1080/13685538.2023.2223699>.
- [21] R. Alvaro, et al., Can educational interventions improve osteoporotic women's adherence to treatment? A literature review, *Orthop. Nurs.* 34 (6) (Nov. 2015) 340–353, <https://doi.org/10.1097/NOR.0000000000000192>.
- [22] T. Jaarsma, et al., Status of theory use in self-care research, *Int. J. Environ. Res. Public Health* 17 (24) (Dec. 2020), <https://doi.org/10.3390/ijerph17249480>.

- [23] N. Cittadini, D. D'Angelo, E. Basili Zannetti, M. Celi, A. Pennini, G. Rocco, Development and testing of a new instrument to measure self-care in patients with osteoporosis: the self-care of osteoporosis scale, *International Journal of Bone Fragility* 1 (1) (Mar. 2021) 28–33, <https://doi.org/10.57582/IJBF.210101.028>.
- [24] M.J. Page, et al., The PRISMA 2020 statement: an updated guideline for reporting systematic reviews, *BMJ* 372 (Mar. 2021) n71, <https://doi.org/10.1136/bmj.n71>.
- [25] A.M. Methley, S. Campbell, C. Chew-Graham, R. McNally, S. Cheraghi-Sohi, PICO, PICOS and SPIDER: a comparison study of specificity and sensitivity in three search tools for qualitative systematic reviews, *BMC Health Serv. Res.* 14 (1) (Dec. 2014) 579, <https://doi.org/10.1186/s12913-014-0579-0>.
- [26] A. Cooke, D. Smith, A. Booth, Beyond PICO, *Qual. Health Res.* 22 (10) (Oct. 2012) 1435–1443, <https://doi.org/10.1177/1049732312452938>.
- [27] C. Lockwood, Z. Munn, K. Porritt, Qualitative research synthesis, *Int. J. Evid. Based Healthc.* 13 (3) (Sep. 2015) 179–187, <https://doi.org/10.1097/XEB.000000000000062>.
- [28] J.E.M. Sale, et al., Decision to take osteoporosis medication in patients who have had a fracture and are 'high' risk for future fracture: a qualitative study, *BMC Musculoskelet. Disord.* 12 (May 2011) 92, <https://doi.org/10.1186/1471-2474-12-92>.
- [29] E. Lau, et al., Patients' adherence to osteoporosis therapy: exploring the perceptions of postmenopausal women, *Can. Fam. Physician* 54 (3) (Mar. 2008) 394–402.
- [30] S. Wilkins, Women with osteoporosis: strategies for managing aging and chronic illness, *J. Women Aging* 13 (3) (Oct. 2001) 59–77, https://doi.org/10.1300/J074v13n03_05.
- [31] D.E. Beaton, R. Sujic, K. McIlroy Beaton, J. Sale, V. Elliot-Gibson, E.R. Bogoch, Patient perceptions of the path to osteoporosis care following a fragility fracture, *Qual. Health Res.* 22 (12) (Dec. 2012) 1647–1658, <https://doi.org/10.1177/1049732312457467>.
- [32] J.E.M. Sale, et al., Strategies used by an osteoporosis patient group to navigate for bone health care after a fracture, *Arch. Orthop. Trauma Surg.* 134 (2) (Feb. 2014) 229–235, <https://doi.org/10.1007/s00402-013-1889-0>.
- [33] D.N. Linton, et al., Educational booklet reinforces knowledge of osteoporosis and influences intentions to improve bone health in previously diagnosed and treated patients, *Osteoporos. Int.* 31 (9) (Sep. 2020) 1703–1711, <https://doi.org/10.1007/s00198-020-05392-2>.
- [34] W.W. Yu, D. Linton, J. Porteous, H. Eatson, R. Jain, J.E.M. Sale, Is a 'healthy diet' and a 'calcium-rich diet' the same thing? Qualitative study examining perceptions of a calcium-rich diet in individuals who have received bone health education, *J. Hum. Nutr. Diet.* 33 (4) (Aug. 2020) 496–504, <https://doi.org/10.1111/jhn.12730>.
- [35] C. Ziebart, et al., An interpretive descriptive approach of patients with osteoporosis and integrating osteoporosis management advice into their lifestyle, *Int J Qual Stud Health Well-being* 17 (1) (Dec. 2022), <https://doi.org/10.1080/17482631.2022.2070976>.
- [36] N. Tibert, et al., Non-pharmacological management of osteoporotic vertebral fractures: patient perspectives and experiences, *Clin. Rehabil.* 37 (5) (May 2023) 713–724, <https://doi.org/10.1177/02692155221144370>.
- [37] M. Brod, M. Rousculp, A. Cameron, Understanding compliance issues for daily self-injectable treatment in ambulatory care settings, *Patient Prefer. Adherence* 2 (Feb. 2008) 129–136.
- [38] C.M. Jachna, S. Forbes-Thompson, OSTEOPOROSIS: health beliefs and barriers to treatment in an assisted living facility, *J. Gerontol. Nurs.* 31 (1) (Jan. 2005) 24–30, <https://doi.org/10.3928/0098-9134-20050101-09>.
- [39] K.M. Mazor, S. Velten, S.E. Andrade, R.A. Yood, Older women's views about prescription osteoporosis medication: a cross-sectional, qualitative study, *Drugs Aging* 27 (12) (Dec. 2010) 999–1008, <https://doi.org/10.2165/11584790-000000000-00000>.
- [40] S.L. Solimeo, T.J. Weber, D.T. Gold, Older men's explanatory model for osteoporosis, *Gerontologist* 51 (4) (Aug. 2011) 530–539, <https://doi.org/10.1093/geront/gnq123>.
- [41] C.G. Unson, E. Siccione, J. Gaztambide, S. Gaztambide, P. Mahoney Trella, K. Prestwood, Nonadherence and osteoporosis treatment preferences of older women: a qualitative study, *J. Women's Health* 12 (10) (Dec. 2003) 1037–1045, <https://doi.org/10.1089/154099903322643965>.
- [42] C. Salter, L. McDaid, D. Bhattacharya, R. Holland, T. Marshall, A. Howe, Abandoned acid? Understanding adherence to bisphosphonate medications for the prevention of osteoporosis among older women: a qualitative longitudinal study, *PLoS One* 9 (1) (2014) e83552, <https://doi.org/10.1371/journal.pone.0083552>.
- [43] J. McKenna, A.F. Ludwig, Osteoporotic Caucasian and South Asian women: a qualitative study of general practitioners' support, *J. R. Soc. Promot. Heal.* 128 (5) (Sep. 2008) 263–270, <https://doi.org/10.1177/1466424008092796>.
- [44] M. Narayanasamy, S. Bishop, O. Sahota, Z. Paskins, N. Gittos, T. Langley, Acceptability and engagement amongst patients on oral and intravenous bisphosphonates for the treatment of osteoporosis in older adults, *Age Ageing* 51 (11) (Nov. 2022), <https://doi.org/10.1093/ageing/afac255>.
- [45] S.J. Besser, J.E. Anderson, J. Weinman, How do osteoporosis patients perceive their illness and treatment? Implications for clinical practice, *Arch. Osteoporos.* 7 (1–2) (Dec. 2012) 115–124, <https://doi.org/10.1007/s11657-012-0089-9>.
- [46] C.A. Hansen, B. Abrahamsen, H. Konradsen, B.D. Pedersen, Women's lived experiences of learning to live with osteoporosis: a longitudinal qualitative study, *BMC Womens Health* 17 (1) (Dec. 2017) 17, <https://doi.org/10.1186/s12905-017-0377-z>.
- [47] D.S. Nielsen, K. Brixen, L. Huniche, Men's experiences of living with osteoporosis: focus group interviews, *Am. J. Mens Health* 5 (2) (Mar. 2011) 166–176, <https://doi.org/10.1177/1557988310372800>.
- [48] A.L. Barcenilla-Wong, M. Cross, M. Fry, L. March, Ambiguity hindering self-management and prevention of osteoporosis in post-menopausal women, *Arch. Osteoporos.* 15 (1) (Dec. 2020) 73, <https://doi.org/10.1007/s11657-020-0683-1>.
- [49] L. B. De Souza, G. M. F. da S. Mazeto, and S. C. M. Bocchi, "Self-managing osteoporosis treatment for well-being recovery mediated by the (in)visibility of the disease signs," *Rev. Lat. Am. Enfermagem*, vol. 18, no. 3, pp. 398–405, 2010, doi: <https://doi.org/10.1590/s0104-11692010000300015>.
- [50] K.M.A. Swart, et al., Factors related to intentional non-initiation of bisphosphonate treatment in patients with a high fracture risk in primary care: a qualitative study, *BMC Fam. Pract.* 19 (1) (Dec. 2018) 141, <https://doi.org/10.1186/s12875-018-0828-0>.
- [51] I.-M. Dohrn, A. Ståhle, K.S. Roaldsen, 'You have to keep moving, be active': perceptions and experiences of habitual physical activity in older women with osteoporosis, *Phys. Ther.* 96 (3) (Mar. 2016) 361–370, <https://doi.org/10.2522/ptj.20150131>.
- [52] S. Alami, L. Hervouet, S. Poiraudou, K. Briot, C. Roux, Barriers to effective postmenopausal osteoporosis treatment: a qualitative study of patients' and practitioners' views, *PLoS One* 11 (6) (Jun. 2016) e0158365, <https://doi.org/10.1371/journal.pone.0158365>.
- [53] V. Baert, E. Gorus, T. Mets, I. Bautmans, Motivators and barriers for physical activity in older adults with osteoporosis, *J. Geriatr. Phys. Ther.* 38 (3) (Jul. 2015) 105–114, <https://doi.org/10.1519/JPT.0000000000000035>.
- [54] A. Ansari, et al., Health information-seeking behavior and self-care in women with osteoporosis: a qualitative study, *Arch. Osteoporos.* 16 (1) (Dec. 2021) 78, <https://doi.org/10.1007/s11657-021-00923-8>.
- [55] M. Compton, W. Ben Mortenson, J. Sale, A. Crossman, M.C. Ashe, Men's perceptions of living with osteoporosis: a systematic review of qualitative studies, *Int J Orthop Trauma Nurs* 33 (May 2019) 11–17, <https://doi.org/10.1016/j.ijotn.2018.11.007>.
- [56] J.A. Kanis, C. Cooper, R. Rizzoli, J.-Y. Reginster, Executive summary of the European guidance for the diagnosis and management of osteoporosis in postmenopausal women, *Calcif. Tissue Int.* 104 (3) (Mar. 2019) 235–238, <https://doi.org/10.1007/s00223-018-00512-x>.
- [57] Management of osteoporosis in postmenopausal women: the 2021 position statement of The North American Menopause Society, *Menopause* 28 (9) (Sep. 2021) 973–997, <https://doi.org/10.1097/GME.0000000000001831>.
- [58] G. Raybould, O. Babatunde, A.L. Evans, J.L. Jordan, Z. Paskins, Expressed information needs of patients with osteoporosis and/or fragility fractures: a systematic review, *Arch. Osteoporos.* 13 (1) (Dec. 2018) 55, <https://doi.org/10.1007/s11657-018-0470-4>.
- [59] R. Alvaro, Bone care nurses and the evolution of the nurse's educational function: the Guardian Angel® research project, *Clin. Cases Miner. Bone Metab.* (2015), <https://doi.org/10.11138/ccmbm/2015.12.1.043>.
- [60] E. Basili Zannetti, et al., Effect of tailored educational intervention to improve self-care maintenance and quality of life in postmenopausal osteoporotic women after a fragility fracture: the Guardian Angel® study, *lg. Sanita Pubbl.* 73 (1) (2017) 65–76.
- [61] N. Cittadini, et al., Factors influencing self-care in postmenopausal women with osteoporosis: the Guardian Angel® multicentric longitudinal study, *Maturitas* 161 (Jul. 2022) 7–11, <https://doi.org/10.1016/j.maturitas.2022.01.013>.
- [62] A. Pennini, et al., An experience of field work learning for healthcare providers: new perspectives between disadvantages and critical issues, *Ann. Ig.* 28 (4) (2016) 252–262, <https://doi.org/10.7416/ai.2016.2104>.
- [63] B. Glaser, A. Strauss, *The Discovery of Grounded Theory: Strategies for Qualitative Research*, Sociology Press, Mill Valley, CA, 1967.