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REVIEW ARTICLE

The State of Frailty Research in Arabic-Speaking Countries: A Scoping Review

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Abstract

Background: Frailty is an age-related decline in function and reserve in one or more physiological systems, which increases the risk of poor health outcomes, hospitalization, and death. Although frailty has been well studied in developed countries, little is known about the state of frailty research in Arabic-speaking countries (ASCs).

Objective: To address this gap in the literature, we conducted a scoping review to map and synthesize the literature on "frailty research" conducted in ASCs.

Method: The Joanna Briggs Institute methodology was used to identify relevant publications. In brief, six databases were searched for key words frailty, frail, vulnerable, older adults, frailty measurement, and Arab countries.

Results: Arabic journals did not yield any relevant articles. Only 27 articles from non-Arabic sources met inclusion criteria, suggesting that frailty research is limited in ASCs. The review showed that the prevalence of frailty varied across different settings (e.g. community, long-term care, and hospitals), with the highest prevalence observed among older adults in hospital settings. Frailty was associated with older age and female sex. Furthermore, it was associated with a number of chronic medical conditions and contributing lifestyle factors. Based on the articles reviewed, there was no consensus on specific too used to assess frailty.

Conclusion: Overall, this review indicates that frailty is a significant issue in ASCs, and more research needs to be done to investigate both how to best identify frailty and how to manage those individuals who are frail.

Introduction

In developed countries, frailty-a state in which an individual has a higher risk of adverse health effects than others of the same age or exposure-is increasingly acknowledged [1]. It is a clinical disorder characterized by a loss of function in one or more physical, psychological, or social areas. Therefore, experts conceptualize frail older people as complex systems teetering on the brink of breakdown or failure [2]. Frailty is strongly associated with advanced age, comorbidities, a low socioeconomic position, and lifestyle risk factors [3-5]. In addition, it predicts surgical complications, falls, hospitalization, and death [6,7]. The impact and burden of frailty, its significance in clinical practice, and the importance of frailty management for older individuals' health and well-being must be considered [8].

The global prevalence of frailty is unknown, and little is known about frailty prevalence and the nature of frailty in different ethnic groups, as frailty research has been conducted predominantly in high-income countries. The concept of frailty has received considerable attention in developed nations (e.g., Europe and North America), as have effective methodologies for diagnosing and quantifying frailty in clinical practice [1,9,10]. In addition, the incorporation of interventions to reduce

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the impact of frailty on individual health and the burden on the healthcare system is evolving rapidly in these nations [11-14]. However, this may not be true in the Arabic world.

Over 422 million people live in Arabic-speaking countries (ASCs) in the Middle East and North Africa, including Egypt, Saudi Arabia, Kuwait, the United Arab Emirates, Lebanon, Yemen, Palestine, Algeria, Libya, Bahrain, Iraq, Morocco, Qatar, Sudan, Syria, and Tunisia [15]. These countries, like more developed ones, are experiencing an increase in the number and proportion of older adults due to an aging population. Research has established a link between frailty as an age-related syndrome and environmental factors such as low education and inadequate nutrition, resulting in a potentially higher prevalence in low- to middle-income countries like those listed above compared to developed nations [16]. However, frailty research may be underdeveloped in these countries, and in order to offer adequate care for frail older people in this part of the world, it is important to understand what is known about frailty in ASCs.

No reviews of research on ASC frailty have been published, according to the authors' knowledge. Thus, we conducted a scoping review to evaluate, map, and consolidate the ASC's published literature on frailty. The review explored two main areas: 1) The reported findings on frailty and its related domains (e.g., prevalence, impact of gender, comorbidities, or other health and social conditions) among individuals aged 60 years and older residing in ASCs; and 2) The utilization of frailty tools to identify and measure frailty in older adults within ASCs. We believe the findings of this review will serve as a foundation for future research on frailty in ASCs.

Methods

The Joanna Briggs Institute (JBI) methodology for scoping reviews was used for this research [17]. There was no patient or public participation in the design, conduction, reporting, or dissemination of this research. A comprehensive protocol has previously been published [18] and is summarized below.

Search strategy

A health research librarian from Dalhousie University, Halifax, Canada, helped the first author (AA) create the search protocol. The strategy followed the Peer Review Electronic Search Strategies (PRESS) guidelines to generate keywords including frailty, vulnerability, older adults, frailty measurement, and Arab (global, language, country) [19]. Experimental, quasi-experimental, randomized, non-randomized, pre-post, and interrupted time-series studies were searched. Additionally, descriptive, analytical, case-study, and cross-sectional observational studies were considered.

Selection criteria

To be included, an article had to meet three criteria: 1) Examine the concept of frailty (as previously defined); 2) Include participants at least 60 years old living in ASCs; and 3) Participants must have been assessed for frailty. We contacted authors directly when we needed additional information about the eligibility of an article. A native Arabic-speaking reviewer (AA) reviewed journal articles written in Arabic or bilingual articles (Arabic/English).

Information sources

The academic databases searched were MEDLINE (Ovid), Embase, CINAHL, PsycINFO, and Scopus. Middle Eastern journals and websites were searched using Google Scholar. We searched the Arabic/English Journal of University Studies for Inclusive Research (USRIJ), Electronic Interdisciplinary Miscellaneous Journal (EIMJ), Zaytuna College Journal, King Saud University Press, and Nile Scientific Journal.

Study selection

To ensure each article met the inclusion criteria, two review team members (AA and SJK) independently screened the title and abstracts followed by the full text of the articles. Any disagreements between the two reviewers were discussed, and a consensus was reached.

Data handling

The search results from each database were uploaded into Covidence [20], where duplicates were removed. AA and SJK reviewed the articles independently and then discussed the contradicting results and their relevance to the research. After screening and selecting the articles, both reviewers independently completed a data extraction form for each study that recorded the study's authors, publication year, purpose, design, country, population characteristics, setting(s), frailty measurement(s), tool descriptions, outcomes, and most significant findings. AA and SJK discussed the data they had gathered and reached a consensus regarding any discrepancies.

Results

The database search yielded 201 publications for examination (Figure 1). CINAHL, Medline, Embase, PsycInfo, Scopus, and Google Scholar identified 19, 12, 110, 6, 53, and 1 article respectively. Fifty-five duplicate documents were removed by Covidence. AA and SJK reviewed the titles and abstracts of the remaining 146 publications using the inclusion criteria. Ninety seven of the 146 articles were excluded due to not meeting eligibility criteria (with the reason(s) given). The full-text review rejected 22 publications that did not match all inclusion criteria or were inaccessible. AA and SJK selected 27 English publications to be included. No Arabic articles were found.

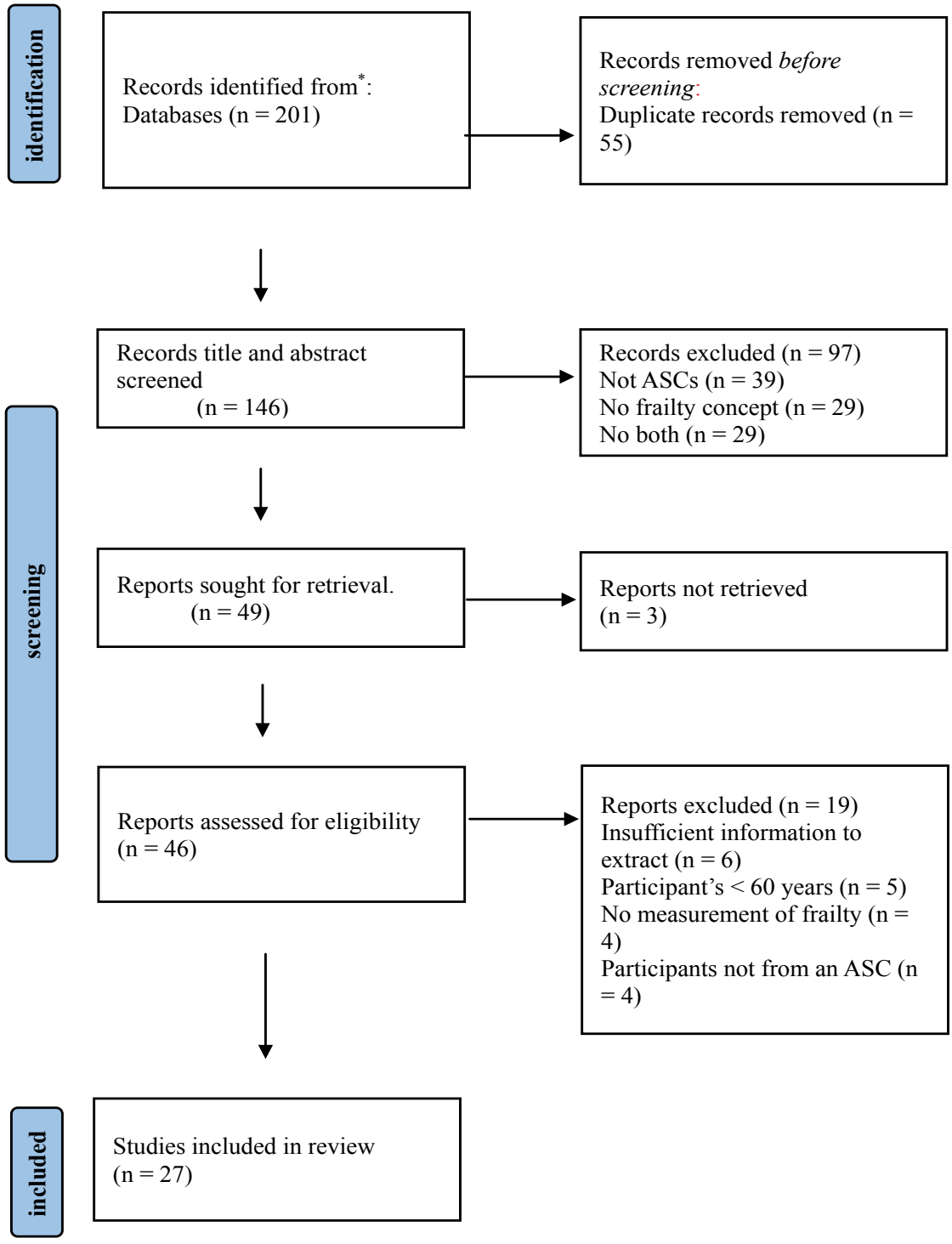

Figure 1: Article search and screening flowchart.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et.al., The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

In most articles (44.4%) frailty was measured as a participant's characteristic. For example, out of the included articles, 4 articles measured frailty to predict adverse health outcomes such as unplanned hospitalization and mortality [21], falls [22], and post-surgery complications [23,24]. In Lebanon, 4 studies focused on the association between frailty and malnutrition status of the participants [25] or the association of frailty with other health conditions [26-28].

Characteristics of included studies

Table 1 summarizes the characteristics of 27 studies included in this review. The review findings identified that most articles (56%; n = 15) were published from 2020 onward. Twenty-one (77.7%) of the studies were cross-sectional by design, while four studies were a cohort design [21-24], one was a case-control study [29], and one was retrospective [30]. The number of participants per study ranged from 47 to 1200. Most of the studies,

Table 1: Descriptive characteristics of articles included.

Study Author (Year)	Ref.	Study Country	Study Design and Duration (M, Y)	Study Setting	Population Age Total (age ± SD) n of Male (age ± SD) n of Female (age ± SD)	Inclusion and Exclusion Criteria
Alqahtani B (2021)	[31]	Saudi Arabia	Cross-sectional (Aug, 19-Jun 20)	Community	≥ 60 T: 486 (range 60-89) M: 317 F: 169	Inc.: ≥ 60 living in Alkharj city. Exc.: Non-Saudi, unstable disease, or medical condition
Esmayel E (2013)	[36]	Egypt	Cross-sectional	Hospital	≥ 65 T: 100	Inc.: Pre-assessment surgical patients, no chronic diseases or disability. Exc.: NA
Abou-Raya S (2009)	[37]	Egypt	Cross-sectional	Hospital	≥ 65 T: 83 (69.9 ± 4.5) M: 41 (69.5 range 65-81) F: 42 (70.1 range 65-83)	Inc.: Patients with HF defined by an EF ± 40%. Exc.: Patients with cancer, advanced liver, or renal disease, systemic inflammatory or connective tissue disease, Parkinson's disease or were on hormonal therapy.
Madbouly K (2017)	[23]	Saudi Arabia	Cohort Study (2012-2014)	Hospital	≥ 60 underwent (Range 60-85) penile prosthesis implantation. T: 54 (64.9 ± 5.2)	Inc.: Patients with first-time penile prosthesis implantation only Exc.: NA
Alqahtani BA (2019)	[32]	Saudi Arabia	Cross-sectional (Aug, 19-Jun 20)	Community	≥ 60 living in Riyadh region T: 47 (70 ± 4) M: 31 F: 16	Inc.: NA Exc.: Any acute illness, unstable health problems that would impair the ability to complete the outcomes measures.
Alqahtani BA (2020)	[33]	Saudi Arabia	Cross-sectional (Apr, 19-Nov, 19)	Outpatient clinic	≥ 65 visit the Prince Sattam bin Abdulaziz University Hospital T: 84 (72 ± 4.7) M: 61 F: 23	Inc.: 65 years of age or older, and able to walk independently. Exc.: Unable to communicate to answer question.
Boules C (2013)	[26]	Lebanon	Cross sectional (Apr, 11-Apr, 12)	Community	≥ 65 T: 1200 (75.3 ± 7.1) M: 591 (75.7 ± 7.2) F: 609 (75.0 ± 6.9)	Inc.: Live at home in rural area, no terminal illness, no tube fed. Exc.: NA
Boules C (2016)	[25]	Lebanon	Cross sectional (Mar, 11-Mar 12)	Community	≥ 65 T: 1200 (75.7 ± 7.1) M: 555 F: 665	Inc.: Live at home in rural area, no terminal illness, no tube fed. Participants living in Gaza or Beirut Exc.: NA

Chakroun-Walha O (2020)	[21]	Tunisia	Cohort Study (Oct, 17-May, 18)	Hospital	≥ 65 T: 184 (unplanned hospitalization 76.9 ± 7.3) Discharge at home 74.8 ± 6.9) M: 91 F: 93	Inc.: ≥ 65 years, presenting at ED during the inclusion period, and consenting participate in the screening, mental disturbance patients are eligible if they accompanied by relatives. Exc.: Patients with Life -threatening condition, patients need immediate management, patients refuse follow-up phone calls.
El Zoghbi M (2013)	[27]	Lebanon	Cross sectional (Mar, 12-Jun, 12)	Senior's home	≥ 65 T: 111 (76.29 ± 8.02) M: 55 (74.49 ± 1.09 F: 56 (78.05 ± 1.02)	Inc.: Participants who had been admitted for more than four weeks. Exc.: Participants refuse to participate, or with renal dialysis, or those with MMSE ≤ 14
El Zoghbi M (2014)	[28]	Lebanon	Cross sectional (Mar, 12-Jun, 12)	Senior's home	≥ 65 T: 111 M: 55 (74.49 ± 1.09) F: 56 (78.05 ± 1.02)	Inc.: Participants who had been admitted for more than four weeks. Exc.: Participants refuse to participate, or with renal dialysis, or those with MMSE ≤ 14
Hakeem FF (2020)	[34]	Saudi Arabia	Cross-sectional	Community & hospital	≥ 60 T: 362 (67.13 ± 6.5) M: 257 F: 99	Inc.: Participants should be residents of the city of Medina, physically independent. Exc.: Older adults with communication problems.
Hammami S (2020)	[38]	Tunisia	Cross-Sectional (Mar, 18-Mar, 19)	Hospital	≥ 65 T: 141 M: 80 F: 61	Inc.: NA Exc.: Younger than 65, unable to communicate, severe dementia, medical urgencies, or no informed consent.
Hamza SA (2012)	[39]	Egypt	Cross-sectional	Community	NA T: 80 (67.58 ± 6.27) M: 32 F: 48	Inc.: NA Exc.: Medical condition that alter the immune system, previous infection with pneumonia, previously vaccinated with the 23-valent pneumococcal polysaccharide vaccine
Hayajneh AA (2021)	[40]	Jordan	Cross-sectional (2016- 2016)	Community	≥ 60, Jordanian T: 109 (67.57 ± 6.95) M: 66 F: 43	Inc.: Jordanian, > 60 and above, able to speak Arabic, no known cognitive impairment. Exc.: NA

Khamis R (2019)	[41]	Lebanon	Cross-sectional (Feb, 15-Apr, 15)	Community	≥ 65, Lebanese T: 390 (76.1 ± 7.6) M: 191 F: 199	Inc.: Residing in urban and rural area of Nabatieh, south Lebanon. Exc.: Sever cognitive dysfunction, very sick.
Khater MS (2012)	[22]	Egypt	Cohrt Study (Jan, 9-May, 10)	Senior's home	≥ 60 T: 84 (71.9 ± 7.2) M: 36 F: 48	Inc.: Being mobile, cognitively competent to understand and follow the instruction. Exc.: Subjects with medical or neurological conditions, and participants with MMSE ≤ 24
Mohamed M (2015)	[42]	Egypt	Cross-sectional	Outpatient clinic	≥ 60 Frail 69.3 ± 7.3 Roubest 64.9 ± 4.5 T: 100	Inc.: NA Exc.: Subjects with malnutrition, hypothyroidism, Liver disease, DM, chronic inflammatory or malignant disease, polytrauma, dementia, back deformity, kyphosis, or limb
Monib S (2021)	[30]	Egypt	Retrospective data analysis (Jun, 15-Jun, 19)	Hospital	≥ 65, breast cancer T: 578 (71 ± 3.4) M: 5 F: 573	Inc.: Presented with symptomatic breast cancer. Exc.: ≤ 65, non-symptomatic, previous breast cancer, local recurrence, or metastasis
Rasheedy D (2021)	[43]	Egypt	Cross-sectional (Oct, 16-Sep, 18)	Hospital	≥ 60 T: 206 (69.45 ± 7.80) M: 98 (69.30 ± 8.05) F: 108 (69.58 ± 7.60)	Inc.: Admitted to the geriatric department. Exc.: NA
Alqahtani B (2021)	[35]	Saudi Arabia	Cross-sectional (Jan, 18-Sept, 18)	Outpatient clinic	≥ 65 (69.9 ± 6.2) T: 270 M: 167 F: 94	Inc.: The ability to walk independently within the household with or without assistive device. Exc.: Cognitive impairment (MMSE ≤ 24), medical condition that could affect participation, unable to read or understand Arabic.
Aly (2020)	[44]	Egypt	Cross sectional (Jun, 18-Apr, 19)	Hospital	≥ 60 T: 300 (70.7 ± 8.3) F: 130 (frail)	Inc.: Female and frail Exc.: Moderate or severe dementia, and catheterized patients

Rasheedy D (2021)	[45]	Egypt	Cross-sectional	Hospital	Total- 82 Phase (1) 20 (M: 11, F: 9) Phase (2) 50 (M: 24, F: 26) Phase (3) 12 (M: 8, F: 4) Age (± SD): Phase (1) (67.6 ± 6.12) Phase (2) (65.02 ± 4.46) Phase (3) (66.5 ± 9.82)	Inc.: Able to read and write in Arabic, cognitively intact, no visual and hearing impairment. Exc.: Illiterate patients, dementia, visual and hearing impairment
Atta Saudi AR (2021)	[46]	Egypt	Cross-sectional (Jan, 18-Jun, 19)	Outpatient clinic	≥ 60 T: 404 (66.5 ± 4.9) M: 215 F: 189	Inc.: Agreed to participate and able to answer the questionnaires. Exc.: Subjects with Parkinson's disease, stroke, and depression
Shokry MM (2021)	[29]	Egypt	Case control (Mar, 19-Dec, 19)	Hospital	≥ 60 type 2 DM T: 88 (range 66-80) M: 32 F: 56	Inc.: Patients with type 2 DM, agreed to participate. Exc.: Refused to participate
Tawfik HM (2021)	[24]	Egypt	Cohort study (Oct, 18-Jun, 19)	Hospital	≥ 60 T: 180 M: 137 F: 43	Inc.: Patients underwent elective cardiac surgery. Exc.: Patients undergoing emergent or urgent operation, anemic patients, neurologic or orthopedic problem, sever cognitive impairment
Daou T (2022)	[47]	Lebanon	Cross-sectional (Sep, 19-Feb, 20)	Community	≥ 65 T: 112 Non-frail: 96 Frail: 16	Inc.: ≥ 65, able to understand Arabic, living independently at home. Exc.: Reported sever neurological or psychiatric disorders, suspected cognitive impairment, unable to walk independently, or using canes, history of bilateral hip replacements, any event in the last year which had a substantial impact on dietary intake and cognitive function (including death or illness of a family member), and currently diagnosed cancer patients

T: Total; M: Male; F: Female; Inc: Included; Exc: Excluded; EF: Ejection Fraction; NA: Not Applicable; MMSE: Mini-Mental State Examination; DM: Diabetes Mellitus.

59.2% (n = 16), were conducted at outpatient clinics or hospitals, 29.6% (n = 8) in the community, and 11.1% (n = 3) at senior homes/long-term care facilities. The greatest number of studies originated in Egypt (44.4%; n = 12), followed by Saudi Arabia and Lebanon (22.2%; n = 6 each), then Tunisia (7.4%; n = 2) and Jordan (3.7%; n = 1). The mean age of participants across the studies ranged from 60 to 89 years. In most studies (n = 15) the number of males and females is nearly equal; however, the number of males is nearly double that of females in studies conducted mainly in Saudi Arabia (n = 4) [31-35] and one study from Egypt [24].

Frailty measurement characteristics of included articles

Table 2 summarizes the characteristics of frailty measurement tools reported in the included articles. Overall, 10 frailty measurement tools were used across all studies. The most commonly used measures were the Fried Phenotype (FP) (n = 8) [24,31,32,34-36,40,44] followed by the Study of Osteoporotic Fractures (SOF-

Table 2: Frailty measurement characteristics of included articles.

Study Author (Year)	Ref.	Frailty measurement tool	Description of the tool	Categories of the frailty measurement	Results of frailty measurement
Alqahtani B (2021)	[31]	Fried phenotype	Weight loss, weak grip strength, exhaustion, slow gait speed, and low physical activity	Non-frail (0) Pre-frail (1-2) Frail (≥ 3)	Non-frail-31.2% Pre-frail-47.3% Frail- 21.4%
Esmayel E (2013)	[36]	Fried phenotype	Weight loss, weak grip strength, exhaustion, slow gait speed, and low physical activity	Non-frail (0) Pre-frail (1-2) Frail (≥ 3)	Non-frail-36 Pre-frail-35 Fail-29
Abou-Raya S (2009)	[37]	Modified Fried	Weight loss, exhaustion, walking speed, and grip strength, has a range of 0-4 with higher score indicating greater frailty	Non-frail (0) Pre-frail (1) Frail (2-4)	Non-frail 27.7% (CHF) 56% (control) Pre-frail 43.3% (CHF) 46% (control) Frail 29% (CHF) 0% (control)
Madbouly K (2017)	[23]	CSHA mFI	Based on the theory of “accumulating deficits”, represents the ratio of the number of parameters present to the total number of parameters assessed.	frailty score (0) no risk factors frailty score (1) those having all the 11risk factors	Average mFI (0.14 ± 0.08)
Alqahtani BA (2021)	[32]	Fried’s frailty phenotype	Unintentional wight loss, exhaustion, slowness, weakness, low physical activity. Each criterion assigned a score of 0 or 1	Non-frail (0) Pre-frail (1-2) Frail (≥ 3)	Non-frail 32.9% Pre-frail 37.7% Frail 29.2%
Alqahtani BA (2021)	[33]	TFI	15 selfs reportent questions 8 physical domaines 4 psychological domaines 3 social domaines	Score 0-15 ≥ 5 indicate frailty higher score indicating frailty	Non-frail 72% Frail 28%
Boules C (2013)	[26]	SOF frailty Index	Involuntary wight loss, inability to rise from a chair without using arms, and reduced energy level for at least 3 days during the past week.	Robust (0) Pre-frail (1) Frail (≥ 2)	Non-frail 33.2% Pre-frail 30.4% Frail 36.4%
Boules C (2016)	[25]	Two measurements: SOF and frailty Index	Involuntary wight loss, inability to rise from a chair without using arms, and reduced energy level for at least 3 days during the past week.	Robust (0) Pre-frail (1) Frail (≥ 2)	Non-frail 371 Pre-frail 341 Frail-408

Chakroun-Walha O (2020)	[21]	ISAR	Brief screening tool includes six items representing frequently observed problems in older adults at ED	Those with a score ≥ 2 out of 6 are considered "at risk" of adverse outcomes	Unplanned hospitalization 3.4 ± 1.8 Discharge at home 2.2 ± 1.6
El Zoghbi M (2013)	[27]	SOF frailty Index	Not stated	Non-frail (0) Intermediate (1) Frail (2)	Association with MMSE Non-frail 24.32 ± 3.64 Intermediate 22.63 ± 4.2 Frail 22.45 ± 4.57
El Zoghbi M (2014)	[28]	SOF frailty Index	Maximum score of 3 indicates frailty	Non-frail (0) Intermediate (1) Frail (≥ 2)	Non-frail- 28 Intermediate- 41 Frail- 42
Hakeem FF (2020)	[34]	Fried phenotype	Weight loss, weak grip strength, exhaustion, slow gait speed, and low physical activity	Non-frail (0) Pre-frail (1-2) Fail (≥ 3)	Non-frail- 36 Pre-frail- 35 Frail- 29
Hammami S (2020)	[38]	Fried phenotype and frailty Index	FI include 34 defecit of multiple system. FI is the number of participant's deficits divided by the total FI number. FP: unintentional wight loss, exhaustion, weakness, slow walking speed, and low physical activity.	FI: Non-frail Frail FP: Pre-frail frail	FP: 20.8% FI: 43.5%
Hamza SA (2012)	[39]	SEGAm	The maximum score is 26 points, each item scored as 0 (most favorable state), 1, or 2 (least favorable state).	Non-frail (0-8) Frail (9-11) Sever-frail (≥ 12)	Non-frail- 50 Frail- 40 Very-frail- 51
Hayajneh AA (2021)	[40]	Fried phenotype	Shrinking, poor endurance, slowness, weakness, and low physical activity	Non-frail (0) Pre-frail (1-2) Frail (≥ 3)	Non-frail- 24 Pre-frail- 36 Frail- 20
Khamis R (2019)	[41]	TFI	8 Physical domains (0-8) 4 physiological (0-4) 3 social (0-3)	Score ≥ 5 indicated frailty	Non-frail- 24 Frail- 85 Frailty total score 7 ± 3.4 Frailty physical domain 3.71 ± 2.33 Frailty psychological 1.95 ± 1.03 Frailty social domain 1.34 ± 0.94
Khater MS (2012)	[22]	GFI	Measuring loss of function in four domains (physical, cognitive, social, and psychological)	GFI total score 0-15 Scor (≥ 4) considered moderate to severe frail	Total frailty score 6.8 ± 3.4 Physical 3.3 ± 2.4 Cognitive 0.1 ± 0.3 Social 2.0 ± 1.0 Psychological 1.4 ± 0.8
Mohamed M (2015)	[42]	SOF frailty Index	The presence of ≥ 2: Unintentional wight loss, inability to rise from a chair 5 times without using arms, and exhaustion.	Robust (0) Pre-frail (1) Frail (≥ 2)	Robust- 39 Pre-frail- 29 Frail- 16

Monib S (2021)	[30]	SOF frailty Index	The presence of ≥ 2: unintended wight loss, inability to rise from a chair without using arms, and reduced energy level	Robust (0) Robust 64.9 ± 4.5 Intermediate (1) Frail (≥ 2) frail 69.3 ± 7.3	Frail- 50 Robust- 50
Rasheed D (2021)	[43]	CFS	Not stated	V fit (1), occasionally active (2), managing well but not dependent (3), managing well but not regularly active (4), mildly frail (5), moderate frail (6), severely frail (7), very severely frail (8), terminally ill (9).	(1 CFS): 269 (2 CFS): 175 (3 CFS): 65 (4 CFS): 11 (5 CFS): 8 (6 CFS): 29 (7 CFS): 14 (8 CFS): 4 (9 CFS): 3
Alqahtani B (2021)	[35]	Fried phenotype	Shrinking, poor endurance, slowness, weakness, and low physical activity	Robust (0) Pre-frail (1-2) Frail (≥ 3)	Non-frail 32.9% Pre-frail 37.7% Frail 29.2%
Aly (2020)	[44]	Frail-Arabic	Fatigue, resistance (stairs), illness, ambulation, and weight	Best (0) Worst (5) Non-frail (0) Pre-frail (1-2) Frail (3-5)	Non-frail- 6 Pre-frail- 24 Frail- 17
Rasheedy D (2021)	[45]	CFS	The CFS ranges from 1 (very fit) to 9 (terminally ill) based on descriptors and pictographs of activity and functional status.	Mildly frail (CFS 5), Moderately frail (CFS 6), Severely frail (CFS 7)	Mild frailty- 88 Moderate-15 Sever- 15
Atta Saudi AR (2021)	[46]	An abbreviated scale compared to CFS	It includes general health survey such as demographic data, chronic and medical condition, and medications	Not stated	Phase (1)- 0 Phase (2)- 18 Phase (3)- 2
Shokry MM (2021)	[29]	CGA and Fried phenotype	Weight loss, weak grip strength, exhaustion, slow gait speed, and low physical activity	Non-frail (0) Pre-frail (1-2) Frail (≥ 3)	Non-frail- 186 Pre-frail- 140 Frail- 78
Tawfik HM (2021)	[24]	Fried phenotype	Unintentional wight loss, exhaustion, slowness, weakness, low physical activity. Each criterion assigned a score of 0 or 1	Non-frail Frail	Non-frail (controlled DM)- 22 Non-frail (uncontrolled DM)-22 Frail (controlled DM)- 22 Frail (uncontrolled DM)- 22
Daou T (2022)	[47]	Multidimensional frailty assessment (Robinson score)	Timed up and go, ADL, cognition, comorbidities, venous blood sample for nutrition and hematocrit, and falls	Non-frail (0-1) Pre- frail (2-3) Frail (≥ 4)	Non-frail- 60 Pre-frail- 60 Frail- 60

CHF: Congestive Heart Failure; SHA mFI: Canadian Study of Health and Aging modified Frailty Index; CGA: Comprehensive Geriatric Assessment; SOF: Study of Osteoporotic Fractures; TFI: Tillburg Frailty Indicator; ISAR: Identification of Senior at Risk; ED: Emergency Department; FP: Fried Phenotype; FI: Frailty Index; SEGAm: Short Emergency Geriatric Assessment; GFI: the Groningen Frailty Indicator; CFS: Clinical Frailty Scale; ADL: Activity of Daily Living

FI) (n = 6) [25-28,30,42] and the Clinical Frailty Scale (CFS) (n = 3) [43,45,46]. Two articles used two measures to identify frailty [25,29,38], one study used the Study of Osteoporotic Fractures (SOF) and the Frailty Index (FI) [25], one study compared FP to FI [38], and the other study used the Comprehensive Geriatric Assessment (CGA) and the FP [29]. Other measurements used in conjunction with frailty measurements included

a comprehensive geriatric assessment (n = 7) [22,29,36,38,39,42,43] and nutritional status using the Mini Nutritional Assessment (n = 5) [25-28,34]. Physical performance (e.g., grip strength and Time Up and Go) was measured in five studies [22,32,33,37,46].

Factors associated to frailty

Table 3 summarizes the studies' objective(s), and which factors the studies assessed (e.g., demographic, social, or health conditions). According to the measurement tools utilized in the studies, the prevalence

Table 3: Factors associated/investigated/or corelated to frailty.

Study Author (Year)	Ref	Study Objective(s)	Factors	P	D	S
Alqahtani B (2021)	[31]	To investigate the prevalence of frailty and socio-demographic and associated clinical factors in Saudi older adults	Sociodemographic, impaired cognition and function	X	X	X
Esmayel E (2013)	[36]	To determine the prevalence of frailty and its association with blood pressure and anthropometric measurements.	Gender, blood pressure, anthropometric measurements (BMI, MUC, MCC)	X		X
Abou-Raya S (2009)	[37]	To evaluate the association between osteoporosis and CHF in elderly and the impact of physical activities and vit D on this association	CHF (EF) and BMD		X	X
Madbouly K (2017)	[23]	Association of the m-FI with adverse outcomes after penile prothesis implantation	No adverse outcome measures were associated with frailty		X	
Alqahtani B (2021)	[32]	To adapt and validate the Arabic version of the FRAIL scale in community-dwelling older adults	Age, comorbidities, MMSE, TUG, grip strength and performance battery	X	X	X
Alqahtani BA (2021)	[33]	To translate and adapt cross-cultural TFI and evaluate its usability and construct validity.	Physical and function activities, and psychological domains.		X	X
Boules C (2013)	[26]	To assess the nutritional status of community dwelling elderly.	Socio-demographic, BMI, malnutrition, chronic pain, insomnia, ADL, chronic diseases, cognitive, loneliness, balance, and falls	X	X	X
Boules C (2016)	[25]	To analyze the relationship between malnutrition and frailty	Socio-demographic, nutrition, depression, and cognitive	X	X	X
Chakroun-Walha O (2020)	[21]	To evaluate the usefulness of frailty screening in predicting outcome (death) of elderly at ED	Functional (ADL), death, type of medical card at the ED, time of delay in ED, social, and comorbidities factors.	X	X	X
El Zoghbi M (2013)	[27]	To investigate the association between cognitive function and nutritional status in elderly	Cognitive		X	
El Zoghbi M (2013)	[28]	To provide a description of nutritional status and its corelated in older adults.	Malnutrition			X
Hakeem FF (2020)	[34]	To examine association between normative and subjective oral health indicators and frailty.	Oral health includes the following measures: self-rated oral health, number of teeth, and functional dentition.			X

Hammami S (2020)	[38]	To investigate the association between pro-inflammatory marker and the development of frailty	Age, gender, living in nursing home, BMI, depression, cognitive, nutrition, inflammatory biomarker, and CPR	X		X
Hamza SA (2012)	[39]	To detect the IgM memory B cell population response in the elderly following vaccination with the 23-valent pneumococcal polysaccharide vaccine and its relation to frailty indices, nutritional status, and serum zinc level.	After vaccination, positive frailty incidence was related to a lower mean IgM B memory cells percentage. A lower baseline percentage of IgM B memory cells was significantly related to age < 70 years,	X		
Hayajneh AA (2021)	[40]	To explore frailty and its corelates among cognitively intact community dwelling older adults.	Depression, comorbidities, physical function, and social function	X	X	X
Khamis R (2019)	[41]	To assess the psychometric properties of the Arabic version of GFI in urban and rural population	Gender, age, level of education, QoL	X		X
Khater MS (2012)	[22]	To evaluate the incidence of falls in a year and its predictive factors among Egyptian nursing home residence	Falls			X
Mohamed M (2015)	[42]	To clarify the impact of IGF-1 level on muscle and bone mineral density (BMD) in frail elderly males.	IGF-1, BMD-3 anthropometric (MAC, MCC, and hand grip strength), T score of BMD			X
Monib S (2021)	[30]	To evaluate patient's performance using the WHO/ ECOG performance status score, CFS, and ASA-PS as the outcomes of management of breast cancer in geriatric population	Demographic, physical and performance status	X		X
Rasheedy D (2021)	[43]	To quantify the effect of the association of frailty, sarcopenia, and malnutrition on other geriatric giants e.g., delirium, cognitive impairment, and functional disability in hospitalized older adults.	Sarcopenia, gender (female are frailer and sarcopenic than male, malnutrition co-occurred with sarcopenia and frailty	X		X
Alqahtani BA (2021)	[35]	Association between physical frailty and sleep quality	Sleep quality, BMI, and cognition		X	X
Aly (2020)	[44]	To detect prevalence and risk factors of UI and its effect of Qol among frail elderly female living in Egypt	Urinary incontinence		X	
Rasheedy D (2021)	[45]	To assess the usability of self-administrated geriatric assessment phone application	NA			
Atta Saudi AR (2021)	[46]	To assess the prevalence of frailty and to evaluate the association between physical frailty and cognitive function and determine the most impaired cognitive domains among frail patients.	Age, gender (male), low education and income, comorbidities, BMI, comorbidities, ADL, IADL, and depression	X	X	X
Shokry MM (2021)	[29]	To detect relation between vit C level and DM control and frailty in elderly patients	Vitamin C			

Tawfik HM (2021)	[24]	To determine the association between pre-operative frailty and the incidence of post-operative complication and to validate Robinson score in geriatric Egyptian undergoing elective cardiac surgery	Age, CHF, DM, readmission	X	X	
Daou T (2022)	[47]	To explore the association between adherence LMD and frailty among older adults in Lebanon	Age, cognitive dysfunction, depression, and polypharmacy	X	X	

P: factors related to the population characteristic; D: factors related to disease/illness; S: factors related to social issues; CHF: Congestive Heart Failure; EF: Ejection Fraction; BMD: Body Mass Density; NA: Not Applicable; m-FI: modified Frailty Index; TFI: Tillburg Frailty Indicator; BMI: Body Mass Index; ADL: Activity of Daily Living; IADL: Instrumental Activity Of Daily Living; ER: Emergency Room; MUC: Mid Upper Arm Circumference; MCC: Mid Calf Circumference; Qol: Quality of Life, DM: Diabetes Mellitus; UI: Urinary Infection; IGF-1: the IGF-1 including IGF-1 and IGF-2 are single chain polypeptide; MAC: Mid Arm Circumference; CFS: Clinical Frailty Scale; ASA-PS: American Society of Anesthesiologists Physical Status; WHO/ ECOG: World Health Organization/Eastern Cooperative Oncology Group; MMSE: Mini-Mental Stat Examination; TUG: Time Up and Go; LMD: Lebanese Mediterranean Diet

of frailty and prefrailty (in which one or two criteria are present) among participants ranged between 21.4% to 37.0% and 30.0% to 47.3%, respectively. These findings suggest a high prevalence of pre-frailty and frailty among Arabic populations compared to other populations from different nations (e.g., Western countries and Japan) [48-52].

In brief, four studies conducted in Saudi Arabia focused on assessing the prevalence of frailty [31,36] or analyzed psychometric properties of frailty measures [32,33]. Of the 6 studies conducted in Lebanon, only one assessed the psychometric properties of a frailty scale [41]. Moreover, three publications evaluated the feasibility, effectiveness, and reliability of three Arabic versions of frailty measures in their respective communities [32,33,41]. Also, four articles used frailty as a predictor of adverse health outcomes (i.e., unplanned hospitalization and death [21], falls [22], and postoperative surgery complications) [26,49] and found increased adverse outcomes in frail patients compared to robust patients.

Of the 27 articles, nine studies investigated the association between frailty and other domains (medical, geriatric, social conditions, and demographic) [25,31,34-36,38,40,43,47]. Three papers, for example, examined the relationship between frailty and age and sex [31,36,41]. They found an increase in the prevalence of frailty was associated with advanced age (≥ 80) and that there was a greater prevalence of pre-frailty in females [31,36]. Several studies evaluated the relationship between frailty and other factors/conditions. For example, one study found that vitamin C levels are lower in frail elderly patients with type 2 diabetes mellitus [29]. Another study reported that higher levels of the pro-inflammatory cytokines, TNF-α, CRP, and especially IL-8 are associated with the development of frailty in Tunisian older adults [38]. In addition, one study found an association between low insulin-like growth factor-1 (IGF-1) and an increased risk of being frail in older Egyptian males [42]. Two studies investigated factors associated with a healthy life (e.g. diet, sleep). One study found that higher frailty is associated with poor sleep quality in older adults in Saudi Arabia [35]. A Lebanese study found that greater adherence to the Lebanese Mediterranean diet (LMD) was associated with a decreased prevalence of frailty [47]. Other studies investigated the association between medical conditions and frailty in older adults. For example, the associations between congestive heart failure (CHF) and sarcopenia [37], urinary incontinence (UI) and the quality of life among frail older women [44]. It was found that higher frailty scores are associated with the presence of any one of these medical conditions.

Of all the studies, one study investigated the use of technology to identify frailty [45]. Specifically, this study assessed a smartphone app's usability and ability to identify older adults with geriatric conditions. The findings of this study shows that the use of such an instrument could help general practitioners provide pre-comprehensive Geriatric Assessment evaluations in areas with limited access to formal geriatric healthcare services, thereby overcoming some obstacles to identifying geriatric syndromes such as frailty.

Discussion

Our scoping review revealed that the prevalence of frailty among individuals aged 60 and above in ASCs differs depending on the study's setting and possibly the assessment tool employed. The prevalence of frailty in hospital settings varied from 12.7% to 51% and in the community context, the prevalence of frailty ranged from 28.3% to 47.3%, while in seniors' homes, the prevalence was 22.4%. Frailty increased with age, sex (female), comorbidities, sociodemographic factors (low education, living alone, and poverty), polypharmacy, and cognitive impairments. Frail people have twice as many health and functional impairments as robust people. This outcome matches other international

frailty research. For example, a Japanese study utilizing the same frailty measurement tools used in several of the studies included in this review indicated that the prevalence of frailty was 1.9%, 3.8%, 10.0%, 20.4%, and 35.1% for those aged 65-69, 70-74, 75-79, 80-84, and ≥ 85 years, respectively [48]. Another systematic review of the prevalence of frailty in Latin America and Caribbean countries indicated that frailty prevalence was 19.6% among community dwelling older adults [49]. An additional systematic review revealed that the overall prevalence of frailty was 10.7% among older adults in Europe and North America where the prevalence of frailty among community-dwelling older adults varied from 4.0% to 59.1% [50]. Overall, the prevalence of frailty in ASCs appears similar to what has been reported in developed and developing countries.

Based on the included studies, compared to developed nations, the average age of the ASC population to develop pre- and frailty is younger. To illustrate, the average age of participants in the studies was 60-89 years, with a few participants being over 75-years-old. This may be attributed to frailty-risk factors in this region. For instance, a higher rate of medical (comorbidity) conditions and social (poor education or poverty) factors may increase frailty and mortality [51]. Other demographic variables that may influence the prevalence of frailty in ASCs include sex (females in ASCs may be less likely to participate in research for cultural reasons), indicating a higher proportion or a greater relative risk of frailty among frail females in ASCs.

Furthermore, pre-frailty prevalence in ASCs also varied based on the study's setting. In hospital settings it ranged from 12.7%-51%, 21.4%-36.4% in the community, and 22.6% in the senior home. These results suggest that identifying a subset at high risk of frailty is slightly greater in ASCs than in non-Arabic nations [23,26,31]. A systematic review found 4.1% of older persons in 10 European nations were frail, whereas 37.4% were prefrail [51]. This shows that future increases in frailty prevalence among older ASC residents are likely and raises the question of whether the average lifespan variations between ASC residents and other nations may be related to frailty and pre-frailty levels. It is commonly known that older people in ASCs live with their siblings or relatives rather than in retirement centres, resulting in fewer LTCFs than in developed nations, which could lead to inadequate care for this subpopulation. Thus, screening and prevention programs may help healthcare institutions identify at-risk patients and provide appropriate care.

Advanced age, female sex, greater comorbidities, cognitive impairment, poor nutritional status, and loneliness are social and medical factors that are positively correlated with frailty levels in ASCs, consistent with previous research involving non-ASCs. These findings are consistent with previous research involving non-ASCs. In a Chinese study, for instance, advanced age, gender, and ethnicity were substantially associated with higher levels of frailty [52]. Additionally, advanced age, greater than 80 years, and female gender were risk factors for increasing frailty among Indian seniors (83.4%) [53]. Data from a meta-analysis also showed that the prevalence of physical frailty was higher among females in 62 countries [54]. A study among older adults in the United States found that frailty was more prevalent at older ages, among women, racial and ethnic minorities, those in supportive residential settings, and persons of lower income [55]. Knowledge of the complexity of frailty's determinants can facilitate the development of measures for prevention and early intervention, thereby enhancing the quality of life for this subpopulation.

Lastly, this review suggests that frailty in ASCs is highly understudied compared to developed nations. The vast majority of articles were published after the year 2020, which suggests that frailty research uptake in ASCs was slower than in more developed countries. Therefore, research on frailty has only recently begun in ASCs, and/or frailty could be an unnoticed or under-researched topic in this part of the world. This lack of data, information, and records regarding the number and conditions of older adults living with frailty in ASCs may pose a challenge when caring for this subpopulation or during a public health emergency such as the COVID-19 pandemic [56].

Limitations and Strengths

The study employed a robust article search strategy. There were no systematic or comprehensive searches for frailty research in this region. Thus, this review is the first to examine frailty in Arabic countries, according to the reviewers. Reviewers examined English and Arabic journal sites for frailty articles, which is another strength.

This may be more of a challenge than a limitation, but the lack of research on frailty, its impact on older people, and its assessment techniques makes it difficult to compare differences in the concept, measurement, and impact of frailty between ASCs and other nations. As with most frailty research globally, the reviewers only included participants 60 and older; hence, the study did not include studies on frailty in lower age groups (< 60). The primary limitation with this review is that a patient/public member was not engaged in the process. Based on language barriers and education levels it deemed not feasible.

Conclusions

This scoping research found high levels of frailty and prefrailty in ASCs, which related to geriatric factors and health problems. Most research examined the relationship between frailty and health concerns like CHF, urine incontinence, sleep quality, and diabetes in

older persons. Cross-sectional and contemporary studies were predominant. Besides Comprehensive Geriatric Assessments (CGAs), research from ASCs utilized FP, FI, and SOF-FI tests to assess frailty. No studies examined frailty management or improvement. However, frailty has a huge influence on individuals, communities, and economies; therefore, future studies should focus on its occurrence, impact, and management to improve research and care for frail older adults in ASCs.

Evidence from the Studies

- Frailty appears to be neglected in ASCs, and research into it is progressing slowly.
- Most studies were cross-sectional and lasted almost a year, so more longitudinal observational studies are needed to assess frailty and pre-frailty prevalence and frail patients' mortality and morbidity.
- No research has examined the etiology, pathophysiology, or genetics of frailty in older persons in ASCs. However, frailty studies will benefit from disparities between industrialized and developing nations.
- No studies adjusted intervention(s) or treatment strategies for frailty in ASCs.
- Due to the high prevalence of frailty and pre-frailty and the lack of research on the feasibility and reliability of screening instruments, Arabic frailty assessment methods must be studied. Translating tools into Arabic may work.
- ASC healthcare systems must network and collaborate with developed-country frailty researchers to devise a crisis management approach for frail older individuals.

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