Assessment of frailty and outcome of an ethnogeriatric population in periurban slums of Delhi, India – An interventional strategy in a primary health care setting

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Abstract

Introduction: The burden of frailty and aging will have a profound impact on the economy along with the deteriorating clinical condition of the olds. **Aim:** This study aim was to assess frailty of an ethnogeriatric cohort and associate it with domains of quality of life in Delhi along with a follow-up outcome assessment. **Method:** Edmonton frail scale on an ethnogeriatric cohort of 200 individuals in periurban slums of Delhi was used and associated with quality of life, calculated by the WHO-BREF –QOL questionnaire. An interventional strategy for healthy aging was adopted, and a follow-up outcome assessment was done to look out for mortality or morbidity. **Result:** There were 37% frail with a mean score of 60 and 25% prefrails beyond 60 years with a significant increase in frailty with age. Females, single, working, and illiterate elderly were frailer as compared to their counterparts. Social domain followed by psychological domain of the QOL had least scores in the frail elderly. Olds, away from their place of origin were 25 times more likely to be frail and had lesser family integration, assessed by regression analysis. Nearly 6% died, with 21% of hospital readmissions after a 6-month follow-up. **Discussion:** An earlier start of assessment would give us more time to react and respond and be pro-active for healthy aging besides taking into consideration the diverse ethnography in our country. **Conclusion:** Cross-cultural variations need the physicians to address the health care disparities and language barriers so as to make interventions more convenient.

Keywords: Aged, frailty, primary care, quality of life

Background

A rapid acceleration of an aging population is a major concern worldwide. Statistics reveal that the rise of older people >65 years, from 461 million in 2004 to a whopping estimated 2 billion by 2050 is going to be spectacular.[1,2] India with its staggering population growth has nearly 104 million elderly persons (aged 60 years or above) according to Population Census 2011; 53 million females and 51 million males. A report by the United Nations Population Fund and Help Age India suggests that the number of the elderly persons is expected to grow to 173 million by 2026.[3] From 5.6% in 1961 the proportion has increased to 8.6% in 2011. For males, it was marginally lower at 8.2%, while for females it was 9.0%.[3,4]

This will have a profound impact on the economy and health care responsibilities of the countries. An even uglier side of an aging dependent population is the clinical condition of frailty, which develops as a result of a cumulative age-related diminution of the physiology of our body systems and, thus, hires an increased

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vulnerability to adverse outcomes in health status; triggered by minute stressor events. However, as a matter of fact, it has been found that frailty degree and severity vary across different age groups among the elderly population. Thus, it becomes imperative for us to know how it develops and how the detection process can be used to pace up the prevention.[5]

India, as a secular nation, harbors the greatest number of people with maximum cross-cultural variations. The fact that poverty, job possibilities, insecurities, education, and health facilities drive or add to the already existing problem of migration is well documented. With such an interim shift, it becomes imperative to meet the challenges of all sections and all ethnic groups with equality. Over the past decades, migration patterns have shown transition from a more uniform and labeled cohort into forming a new pattern of the colony which is more heterogeneous. This form of super-diversity demands a stratified health care approach to the issues of aging or gerodiversity.[6,7] As health providers, we need to understand this perception of how ardent and staunch a person's life-long belief or attitude is knitted within himself and what a mammoth task it is to do away without giving this its share of consideration.[7,8]

Many reliable models of frailty have been assessed based on biological principles of causality.[9-15] Prospective studies assessing the diagnostic test accuracies for identifying frailty among community-dwelling older people (aged ≥65 years) done by Clegg *et al.* found that no single test is good enough for a diversified depiction.[5,16,17] The arena for multicultural geriatrics in a primary health care setting demands a rapid assessment technique that can also be performed by nongeriatricians.[18-20]

The recent 2016 research which was conducted by the WHO's Study on Global Ageing and Adult Health (SAGE) studied six countries including India to look for the pattern of frailty and found that India has the lowest percentage (44.5%) of people without frailty.[21,22] Studying the status of frailty moreover would provide us with an assumption of where not to intervene unnecessarily. With the increasing number of governmental programs and policies for the elderly, screening an older person with frailty can enable us to do a more appropriate assessment so as to make diagnosis of an underlying cause. This will ease in the provision of appropriate support to allow an older person with frailty to stay at home and prevent an avoidable and potentially disruptive visit to the emergency department. The present study will help us target these factors while deciding on assessment or interventions for a group of culturally different populations. Structuring a database for the policymakers and facilitating planning and intervention policies would also be eased.

It was taken up with the following objectives:
1. Assessment of frailty among the multicultural community dwellers residing in the periurban slum areas of Delhi, the capital of India, by using the Edmonton Frail Scale.
2. Associate frailty status with the quality of life of the ethnogeriatric cohort using the updated WHO – QOL BREF questionnaire.

3. Intervene and enhance conditions for healthy aging.
4. Assess the adverse outcome of elderly community dwellers in terms of any morbidity or mortality over a 6 monthly follow-up.

Methodology

The study was conducted in a primary health care setting in the Health and Training Centres of Department of Community Medicine, Hamdard Institute of Medical Sciences and Research (HIMSR), Jamia Hamdard – New Delhi which caters to an aggregate population of 2.5 lakh with 12% of elderly as per the center records.

The described locality is a border area within a 2-km radius with the confluence of three states meeting at this perimeter with varied culture, understanding, mentalities, acceptances, and beliefs. It also has clusters of the migrated population from nearby countries as refugees. This makes the region super diverse with an array of extreme values and health demands. A list of all elderly population more than 60 years was procured from the center's Geriatric register, and line listing was done. Sampling was done based on probability proportional to population size (PPS) and a final systematic random technique to select the households. The motive was to have a proportionate representation of the dense Muslim and Hindu communities, Jat and Rajput communities, Rohingya refugees, Bengali Pada, scheduled and backward tribes, contract laborers and ragpicker colonies, and other such canvassed communities.

An extensive review of the literature was done which showed a wide-ranged prevalence of 10–60 percentage of frailty among the elderly.[23-27] Considering a prevalence of 30 percent among the frail olds in a multicultural setting and at a confidence limit of 5% with 95% interval, with an absolute error of 7% with 10% nonresponse, we rounded it off to 200. The study was carried from March 2018 till July 2019 with a pretested validated Edmonton Frailty assessment questionnaire and the WHO-QOL-BREF (Quality of life) questionnaire from the willing study participants who consented.

The WHO-QOL-BREF has 26 questions, and the mean score of items within each domain is used to calculate the domain score.[28] For a multicultural and primary health care setting, we preferred the Edmonton frail scale which is reliable and convenient for use on a diverse group, as well as a rapid tool for use by front-line health workers.[17,29] The assessment and data collection was done by house visits in a community-based cross-sectional design by health workers. The eligibility of study participants was an elderly >60 years who consented and was a resident of that community for the last 6 months. All others not willing to participate and those who were acutely ill so as not to be able to participate in the assessment were also excluded from the study. There was no financial burden imposed on the subjects, and there was an appropriate institutional ethical clearance.

The subjects were tracked and called up to the center every month to the Geriatric clinic. Over here, they were repeat checked for vitals, nutrition status, mentation, cleanliness, cognition, muscle power, zeal for life besides attending to any other problem. There were community health talks in groups where we chose one of their peers from the community to interact with them along with the health facilitators. We held individual counseling (with interpreters or repetitions by the teach-back method if needed)[30] after adequate adjustments and coping strategies for any sort of communication barriers, language, regional differences, health attitude, and health literacy. All these activities were penned down in registers for future references and track. After 6 months, we made a home visit into the houses of those elderly who came out to be in the frail category. Their self-reported responses regarding their conditions were noted, and prescriptions were checked. The olds in the severe frail category were referred to the tertiary care hospital for a comprehensive geriatric assessment by specialists, while the moderate and the mild categories were repeat assessed at the primary center itself by nongeriatricians. Health education and intervention in the form of exercises, muscle power improvement techniques, responsibility-sharing at home were taken up. An outcome assessment was done based on:
1. Any mortality: checked from records or clarified from relatives
2. Morbidity: in form of hospital admissions

Result

Table 1 shows the association of frail elderly and the socio-demographic details and QOL. Almost 45% and 80% of early and late elderly were frail. Frailty increases with an increase in age, women, and single subjects with statistical significance. ANOVA of the QOL scores found a difference in the mean score across various age groups which were significant. A similar significant difference in mean was observed across the categories for marital status, education, occupation, and income.

Mean difference across the 3 categories of frailty was different and had statistical significance across all four domains of QOL as per Table 2. Mean was found to be lower for frail elderly and higher for the nonfrails which bore statistical significance at a *p value < 0.05*. The most affected domain with the least mean QOL was the social domain followed by the psychological domain. Post hoc test showed intergroup significance level at which we rejected the null hypothesis. It was found that the mean difference of the frailty score was statistically significant between the frail and pre-frail categories under all four domains of quality of life.

The step forward approach to analyze demographic and social factors showed significant *P* value. An increase in age caused a greater probability of frailty as compared to the nonfrailty which is the reference here. Odds ratio denotes a 90% probability of frailty in the age group 60–65 years as compared to those who are above 75 years. The married were significantly less probable to be frail. The males, Hindus, and those residing away from the place

of their origin were much more likely to be frail as compared to their counterparts. Similarly, lesser integrated were more like to be frail or prefrail and statistically significant.

On a follow-up inquiry of 52 frails out of a total of 76 frail elderly (rest being lost to follow up), it was found that three people died, 21% were readmitted to the hospital for some or other reason, whereas there were 13% of new admissions. Yet here were 36.5% who were diagnosed and prescribed for a new disease.

Discussion

Analysis of 200 elderly in an ethnogeriatric cohort showed that there were 38% frails, 25% prefrails, and 37% nonfrails among the subjects with a median score of 60, 75, and 80, respectively as depicted in Figure 1. Siriwardhana *et al.*, in his meta-analysis found that the prevalence of frailty varied from 3.9% (China) to 51.4% (Cuba), and the prevalence of prefrailty ranged from 13.4% (Tanzania) to 71.6% (Brazil). Such wide variation in rates across various studies can largely be explained due to differences in the assessment method and the age cut-off values. A near similar result was shown by a study done on rural north Indian women who were 31% frail and 40% prefrail. Unlike other studies, the prevalence of frailty was higher as compared to the prefrail category. This could be one of the possibilities because of the adjustment and different scale of assessment we adopted, in order to make up for the highly varied cross-cultural variations among our study population.[23,24]

An important dilemma is how we define old. Many define it based on certain life events rather than just using the chronological cut-off values. Ethnic minorities bear the burden of chronic ailments, disability, social disparities, and premature mortality; as a result, they progress towards aging much earlier than their counterparts. This has definite implications both for research and health provision; as we need to shift our service delivery for the elderly to an earlier start and not merely based on the age cut-off.[31,32]

In Table 1, frailty increased with an increase in age, in women and singles significantly. A similar result was shown by an
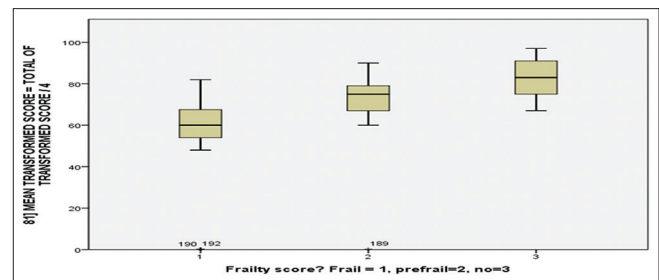

Figure 1: Mean transformed frailty score among the elderly population Out of the total of 38% frail, 25% prefrail, and 37% nonfrail, the box and whisker plot shows the range, median, and quartiles of the three classes of the elderly population. Frail had a median score of 60; pre-frail, 75; and nonfrail, 80

Socio-demographic factors	Parameters	Status of Frailty			Total (*n*=200)	QOL Score (ANOVA) MS, *F*, *P*
		Frail	Prefrail	Nonfrail		
AGE	60-65	38 (30)	28 (22)	61 (48)	127 (100)	1.8, 3.1, 0.000
	65-75 (early)	23 (42.6)	19 (35.2)	12 (22.2)	54 (100)	
	75 and above (late)	15 (78.9)	4*(21.1)	0*(0)	19 (100)	
	χ^2, df, *P*: 28.1, 4, 0.0001					
SEX	Male	29 (30.2)	25 (26)	42 (43.8)	96 (100)	0.52. 2.8, 0.000
	Female	47 (45.2)	26 (25)	31 (29.8)	104 (100)	
	χ^2, df, *P*: 5.6, 2, 0.06					
MARITAL STATUS	Married	52 (35.4)	38 (25.9)	57 (38.8)	147	0.4, 3.3, 0.000
	Single	24 (45.3)	13 (24.5)	16 (30.2)	53 (100)	
	χ^2, df, *P*: 1.8, 2, 0.4					
EDUCATION	Illiterate	60 (42.3)	37 (26.1)	45 (31.7)	142 (100)	0.9, 1.9, 0.004
	10 and 20	11 (23.4)	12 (25.5)	24 (51.1)	47 (100)	
	High School above	5 (45.5)	2* (18.2)	4*(36.4)	11 (100)	
	χ^2, df, *P*: 7.3, 4, 0.1					
OCCUPATION	Working	12 (46.2)	0* (0)	14 (53.8)	26 (100)	0.3, 3.5, 0.000
	Not working	64 (36.8)	51 (29.3)	59 (33.9)	174 (100)	
	χ^2, df, *P*: 10.6, 2, 0.005					
INCOME	<5,000/month	17 (35.4)	11 (22.9)	20 (41.7)	48 (100)	0.4, 3.1, 0.000
	>5,000/month	59 (38.8)	40 (26.3)	53 (34.9)	152 (100)	
	χ^2, df, *P*: 0.7, 2, 0.6					
RELIGION	Hindu	60 (38.7)	37 (23.9)	58 (37.4)	155 (100)	0.2, 1.3, 0.09
	Muslim	16 (36.4)	14 (31.8)	14 (31.8)	44 (100)	
	Others	0*(0)	0* (0)	1* (100)	1 (100)	
	χ^2, df, *P*: 2.9, 4, 0.5					

Table 1: Association of sociodemographic factors with Status of frailty and Quality of Life

χ^2, df, *P*: Chi-square, degree of freedom, Probability value. *Fischer exact test for cell value <5. MS, F: Mean square (combined) and F statistic, QOL score: Quality of life score. Single: Either divorce, widow, or separate

elderly working population who had lesser frailty. Most of the frail elderly were illiterate and Hindu. The prevalence of frailty and prefrailty in the recent systematic review was reported to be 40%–59.1% and 44.2%. Across 11 studies, frailty was statistically more prevalent in women and increased steadily with age. However, the range varied in the different ethnic populations.[5]

ANOVA of the QOL scores found a difference in the mean score across various age groups, which was significant. A similar significant difference in mean was observed across the categories for marital status, education, occupation, and income.

Nearly 34%, 37%, and 24% of frails took tobacco, alcohol, or smoke. About 30% of the frails never prayed and spent less time for recreational activities and more than 50% were vegetarian as shown in Figure 2. A study by the American Medical Association in 2011 established a significant consistent association between survival hazard ratio for gait speed with age, sex, race, BMI, smoking, alcohol, prior hospitalization, and multimorbidity.[33]

Cross-cultural variations need the physicians to address the health care disparities, language barriers, health literacy, acculturation level, and culturally defined beliefs. Elements such as baseline preventive care, language, any form of communication barriers, health literacy and level of acculturation level, etc. need to be targeted so as to make interventions more parallel.
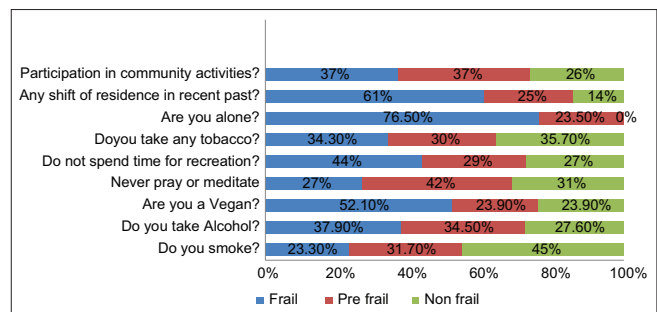

Figure 2: Characteristic traits among the frail elderly individuals
The horizontal bar shows that nearly 34%, 37%, and 24% of frails take tobacco, alcohol, or smoke. Nearly 30% of frails never meditate or pray and spend less time for recreational activities. Just more than 50% are vegetarian by diet; whereas, 24% of prefrails are vegans. A striking 76% of frails were staying alone and 61% had shifted their residence in therecent past after -retirement. Just 37% participated in the community activities for societal benefits.

It was found in Table 2, that the mean difference across the three categories of frailty i.e., frail, prefrail, and nonfrail was different (mean QOL score being lower for frail and higher from nonfrail) and had statistical significance across all four domains of Quality of Life. Chaudhary *et al.* described frailty increased with a decrease in QOL for higher age groups and was more in women. Lower frailty and high QOL were associated with a higher level of education and income.[34]

The potential correlates of increased frailty and reduced quality of life can be intervened, and we can progress to early detection

Domains in QOL	Status of frailty	Value Characteristics		ANOVA	*Post hoc* test (bonferroni)
		n	Mean QOL	Df, F, Sig	Sig
Physical	Frail (1)	76	67.2	2, 86.1, 0.000	0.000 (1,2), 0.000 (1,3)
	Prefrail (2)	51	87.6		0.000 (2,1), 0.000 (2,3)
	Nonfrail (3)	73	105.9		0.000 (3,1), 0.000 (3,2)
	Total	200	86.5		
Psychological	Frail (1)	76	58.8	2, 38.2, 0.000	0.000 (1,2), 0.01 (1,3)
	Prefrail (2)	51	72.7		0.000 (2,1), 0.01 (2,3)
	Nonfrail (3)	73	81.3		0.00 (3,1), 0.11 (3,2)
	Total	200	70.5		
Social	Frail (1)	76	29.7	2, 31.4, 0.000	0.00 (1,2), 0.00 (1,3)
	Prefrail (2)	51	37.9		0.00 (2,1), 0.21 (2,3)
	Nonfrail (3)	73	40.1		0.00 (3,1), 0.17 (3,2)
	Total	200	35.9		
Environmental	Frail (1)	76	72.9	2, 44.3, 0.000	0.00 (1,2), 0.00 (1,3)
	Prefrail (2)	51	92.1		0.00 (2,1), 0.02 (2,3)
	Nonfrail (3)	73	105.5		0.00 (3,1), 0.02 (3,2)
	Total	200	89.7		

Table 2: Status of Frailty versus the various domains of Quality of Life among the elderly population

and action level. This should help us bring about a reversal in frailty and impart a beneficial impact on the quality of life of the elderly who are under the veil of multiple burdens.

Our study statistics as depicted in Table 3 show the odds of frail factors that directly or indirectly contribute to a poor QOL. It helps us pool a group who can be given additional therapeutic consideration and implementation. As in absolute terms, this cohort also requires more societal resources, like institutionalization and hospitalization, etc.; their identification can also help us better utilize the constrained resources available. A study by Buckinx *et al.* 2015 provided evidence of early screening on the monetary benefits gained both to the individual as well as to the society.[35,36]

Evidence shows that there is a decrease in deaths and morbidities in frail individuals if there is appropriate and planned action to improve their quality of life through various strategies by the government. Action if not done at the right time and right frequency becomes inaction and can add up to our already existing burden.

The outcome in form of survival analysis by Leme DEC *et al.* corroborated the importance of frailty as a predictor of lower survival time, independently of the functional status and number of simultaneous chronic diseases.[37] The literature emphasizes that diseases such as hypertension, diabetes, and cardiovascular diseases are more associated with the frailty syndrome with a poorer outcome, by the mechanism of activation of proinflammatory pathways over the long term.[38,39]

Coexisting factors such as multimorbidity and polypharmacy also adds to the peril as documented by Panda *et al.* Varied approaches show a theoretical foundation for the medical and psychological management of the older adults that prioritizes their cultural identity, society, community, and family.[37,40-42]

Table 3: Logistic Regression to find out the association of Frailty with various factors

Factors	Category	FRAIL [B, OR, *P*]	PREFRAIL [B, OR, *P*]
Age	60-65	-19.4, 0.9 (0.98)	-17.6, 0.8 (0.99)
	65-75	-14.9, 0.7 (0.99)	-14.7, 0.7 (0.98)
	>75	0,1	0,1
Sex	Male	-0.09, 0.9 (0.93)	2.7, 15.1 (0.01)
	Female	0,1	0,1
Marital status	Single (Widow/divorce)	4.5, 78.8 (0.02)	1.2, 2.8 (0.5)
	Married	0,1	0,1
Religion	Hindu	20.9, 91 (0.00)	21.3, 136 (0.00)
	Muslim	20.6, 12 (0.00)	21.6, 255 (0.00)
	Others	0,1	0,1
Away from a place of origin	Yes	3.2, 25.4 (0.00)	3.2, 24.2 (0.03)
	No	0,1	0,1
Family Integration	Isolated	6.9, 1073 (0.9)	42.9, 4.7 (0.9)
	Not Integrated	5.3, 200 (0.00)	1.7, 5.6 (0.1)
	Somewhat Integrated	-7.6, 0.8 (0.9)	-23.6, 1.03 (0.9)
	Well integrated	0,1	0,1

B, OR, *P*: Coefficient, Odds Ratio and Probability value, Ref: Reference

To summarize, the quality of life in terms of physical, social, environmental, and emotional aspects are hampered with associated frailty. Factors such as friends, prayer, habits, residence, family, education, marriage, etc., play a major role in abating or enhancing the conditions of suffering. Follow-up visits found that there were 21% who had taken revisits to the hospital for their conditions

Appropriate clearance for ethics and consent was taken, and there was no conflict of interest. Autonomy, beneficence, and confidentiality were strictly maintained.

Limitations: The sample size lacked a comparison with a control group as it couldn't be taken up on a mega scale. Moreover, a cohort follow-up at repeat intervals would provide a better outcome and survival analysis.

Conclusion and Recommendations

We could establish an association of frailty and poor quality of life along with the types of domain affected most. This is important for the timely identification of risk between the specific group which has scope for reversal. Our study also pointed out the associated traits in frails which provide us a direction to look for the prevention strategies. We could also provide an important piece of information regarding the place of origin and its impact on QOL and frailty. When we age at our own place, among our owns relatives, we age gracefully. Our study gave an impetus to this general statement and a dimension to work on this area towards "Healthy Ageing at Place". We could stress the avoidance of unnecessary referrals and evaluation for frail and rather focus on systemic evaluation for the vulnerable class only.

As aging in many communities is defined more by the occurrence of life events rather than chronological age, it also becomes important for policies and administration to start looking prior to and beyond the cut-off for age. An earlier start of assessment would give us more time to react and respond and be proactive for healthy aging. Ethnicity and cross-cultural attributes are knitted so well within a person's belief system that it gets manifested in the way he lives. Here, it becomes important to validate a separate instant assessment system for them, taking into account the various barriers associated and, thus, negating them out.

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Conflicts of interest

There are no conflicts of interest.

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