



Associations of Self-Reported Sleep Quality with Demographic and Other Characteristics in Older Korean Immigrants

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Abstract

Poor sleep is common among older adults, affecting a wide range of health outcomes. However, little is known about sleep issues among older Korean immigrants, the fastest growing Asian American subgroup in the United States. We aimed to explore multiple factors associated with sleep among this group. We analyzed cross-sectional survey data from 43 older immigrants living in two large Korean communities in Southern California. Perceived sleep quality was significantly associated with gender, living arrangement, employment status, mental health, and sleep-related beliefs (all p -values < 0.05). Living with someone and being employed for wages were significantly uniquely associated with better sleep quality, accounting for demographic and health-related factors ($R^2 = 51.8\%$, adjusted $R^2 = 38.7\%$, $p = 0.002$). These findings suggest a potential role of sociocultural factors on sleep. Further studies are needed to confirm these findings and to inform a sleep intervention program tailored to the characteristics of older Korean immigrants.

Keywords Perceived sleep quality · Health · Minority · Older adults · Korean immigrants

Background

Sleep problems are common among older adults. Compared to younger adults, they take longer to fall asleep, complain of waking up more often during the night, experience shorter sleep duration, and take more naps [1–3]. Untreated sleep problems among older adults are associated with impaired daily functioning [4], cognitive impairment [5], increased

risk of falls [6], poorer mental health [7], and higher rates of mortality [8].

There are racial/ethnic sleep health disparities [9–12]. Although most studies compared Blacks or Hispanic/Latino individuals to Whites, some evidence showed poorer sleep among Asian Americans than other racial/ethnic groups. For example, Asian Americans experienced significantly shorter sleep duration compared to Whites, which remained significant after adjusting for demographic (e.g., age) and health-related variables (e.g., comorbidity) [11–15]. Older Asian Americans also had a higher prevalence of sleep-disordered breathing than Whites [14, 16], a key contributor to poor sleep.

Older Korean Americans are among the fastest-growing subgroup of Asian immigrants in the United States (U.S.), but one of the most underserved and understudied [17, 18]. Studies [19, 20] show that up to 83% of older Korean immigrants in the U.S. experience sleep problems. They also have a high prevalence of chronic disease (e.g., diabetes) and mental health conditions (e.g., depression) [21, 22]. Other health risks associated with the high prevalence of sleep problem are further compounded by low health literacy levels. The majority (90%) of older Korean immigrants can only speak Korean and more than 70% experience trouble

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understanding medical terminology, even when the materials have been translated into Korean [23, 24]. Additionally, in California, Korean immigrants have the lowest rate of health insurance coverage among Asian American groups [25]. These factors exacerbate the potentially high rates of undetected, undertreated, and poorly managed sleep problems. However, little is known about factors (e.g., demographic, acculturation) that may influence sleep among older Korean Americans, particularly those who are immigrants. No prior studies of older Korean immigrants measured self-reported sleep using a standardized tool. Assessing sleep-related beliefs in this group is also important given the evidence that unhelpful beliefs and attitudes about their sleep (e.g., unrealistic expectations about sleep) are associated with insomnia in general population [26–28].

In this paper, we explored multiple factors associated with self-reported sleep quality among older Korean immigrants. We hypothesized that self-reported sleep quality will be associated with demographic characteristics, acculturation, sleep-related beliefs, and mental and physical health among this subgroup of the population.

Methods

Study Design and Participants

This cross-sectional study recruited participants from two counties in California: Orange County and Los Angeles County. Recruitment was facilitated by the Orange County Korean American Health Information and Education Center (OCKAHIEC). OCKAHIEC is a community-based Korean health information center in Orange County dedicated to helping Korean immigrants solely in the areas related to health.

A research assistant (RA) distributed study flyer to the OCKAHIEC, and staff at the center were asked to refer potential participants. Study flyers were also distributed to the Korean American Federation of Orange County and local Korean community in Orange County and Los Angeles County. Potential participants were eligible for this study if they (a) were Korean American immigrants (i.e., a resident of the U.S. with a birthplace in Korea), (b) were able to speak, read, and write in Korean and/or English, (c) were aged 60 or older (i.e., self-reported age), and (d) did not have self-reported history of cognitive impairment such as dementia. A bilingual RA conducted face-to-face screening using a brief questionnaire that contained eligibility criteria addressed above and the Insomnia Severity Index (ISI) [29]. Our study did not exclude potential participants based on the ISI score. Instead, it was used to ensure that our study enrolled participants from the full range of sleep issues (i.e., from having no sleep to severe symptoms of poor sleep). The

RA made invitation calls to eligible individuals. They were given the options of (1) completing a questionnaire survey in-person or by phone, (2) participating in a face-to-face focus group or one-on-one phone interview, or (3) participating in both parts of the study. The RA obtained informed consent from interested individuals for participation. Study recruitment and data collection was conducted from November 2019 through June 2020. The study was approved by the Institutional Review Board at our institution.

A total of 110 individuals completed the brief screening questionnaire. Of which, 67 individuals refused to participate in the study or did not respond to our calls, resulting in a sample of 43 individuals who completed the Korean version questionnaire survey. Twenty-eight of 43 individuals also participated in a focus group or phone interview. This paper reports survey results only.

Measures

Demographic variables included calculated age (date of interview minus date of birth), gender, marital status, living situation, living arrangement, years of residing in the U.S., levels of education, employment status, and annual house income.

Health and other variables. The Katz/Charlson comorbidity index [30] was used to assess medical conditions. Body mass index was calculated from self-reported weight in kilograms divided by height in meters squared. The 15-item Korean version of Geriatric Depression Scale (GDS)[31, 32] was used to assess depressive symptoms (higher score indicates greater symptom severity). The Korean version of the Patient-Reported Outcomes Measurement Information System (PROMIS) global health items [33] was used to obtain self-reported physical and mental health scale scores. Acculturation was assessed using the 12 item, Short Acculturation Scale for Koreans (SAS-K) [34], which was developed based on the Short Acculturation Scale for Hispanics [35]. It contains three subscales: language use, media, and ethnic social relations. The responses provided by each respondent were averaged across items (range from 1 to 5) with higher scores, indicating more acculturation to the U.S. culture. Sleep-related beliefs were measured with the Korean version of Dysfunctional Beliefs and Attitudes about Sleep-16 items (DBAS-16) [36]. Higher scores represent stronger endorsement of the beliefs about perceived consequences of insomnia. DBAS overall scores of > 3.8 are associated with clinically significant insomnia [28].

Sleep Measures. Risk of sleep apnea was assessed using the STOP questionnaire [37]. We used two types of global sleep measures: Pittsburgh Sleep Quality Index (PSQI) [38, 39] and Medical Outcomes Study Sleep Scale (MOS-Sleep) [40, 41]. The PSQI [38, 39] is an 18-item questionnaire which assesses sleep quality and sleep disturbances over the

past month. It contains three subscales: sleep efficiency, perceived sleep quality, and daily disturbances. A total score > 5 indicates poor sleep quality [39]. The MOS-Sleep [40, 41] is a 12-item measure which yields six dimensions (sleep disturbance, sleep inadequacy, somnolence, quantity of sleep, snoring, and awakening short of breath or with a headache) and a sleep problems index (summarizing information across the 9 items). Daytime sleepiness was measured with the Korean version of Epworth Sleepiness Scale (ESS) [2, 42]. A higher score indicates higher daytime sleepiness.

The Katz/Charlson comorbidity index and the MOS-Sleep were translated into Korean by a Korean-English bilingual researcher and then back translated into English by another bilingual researcher. A panel of bilingual experts examined meaning of each item of both versions and reworded the item if it showed content discrepancy between both. The reworded item was reexamined by the panel to achieve semantic equivalence [43]. Correlation between the PSQI score and the MOS-Sleep problem index was strong with $r = 0.860$ in this study ($p < 0.001$).

Data Analysis

Descriptive statistics were used to summarize participants' characteristics including demographics, sleep and other health-related information, and sleep-related beliefs. Student t-test and Pearson correlation coefficients were calculated to test associations between sleep and other variables. The significance level for each of the bivariable tests was assessed and independent variables with a p-value < 0.10 were included in an ordinary least squares model regressing the PSQI score on other variables. We included age in the regression model regardless of the significance level, given the considerable evidence for age differences in sleep [44, 45]. We did not include income in the model because of its substantial missing data ($n = 10$). For the regression model a p-value < 0.05 was considered statistically significant. Additionally, we conducted sensitivity analysis by pulling out a non-significant predictor from the model at once to check whether there is any change of unique contribution of each predictor on the PSQI score. Analyses were conducted using Stata statistical software (version 15, Stata Corporation, College Station, TX).

Results

Participant Characteristics

Participant characteristics are shown in Table 1. The average age was 72 years. Two participants with a calculated age of 59 reported their age as 60 on enrollment based on the Korean custom of considering a person to be age 1 at

birth. 58% were women, 58% were married, 35% lived alone, and 35% were employed for wages. The mean SAS-K score was 1.48 (SD 0.39), indicating low levels of acculturation. Average DBAS-16 score was 5.14 (SD 2.03), which suggests elevated levels of maladaptive sleep-related beliefs and attitudes. The PSQI total score was 6.65 (SD 4.29) (see Table 2). Twenty-three participants (53%) experienced poor quality of sleep (a PSQI total score > 5). The average score on the MOS 9-item sleep problems index was 24.03 (SD 17.35), which showed slightly better sleep than the U.S. population [40].

Associations Between Sleep and Other Variables

Women ($n = 25$), participants living alone ($n = 15$), and participants who were employed for wages ($n = 15$) showed significantly higher (worse) PSQI total score (all $p < 0.01$, Table 3). A higher PSQI total score was also significantly associated with higher (worse) GDS scores ($r = 0.421$), lower (worse) PROMIS global mental health scores ($r = -0.372$), and higher DBAS-16 scores (greater dysfunctional beliefs and attitudes about sleep; $r = 0.421$). There were no significant differences in the PSQI based on other demographic characteristics or acculturation.

Multivariable Associations with Sleep Quality

In a model predicting the PSQI score, the nine variables including demographics, depression, physical and mental health, and sleep-related beliefs explained a significant proportion of the variance (see Table 4: $R^2 = 51.8\%$, adjusted $R^2 = 38.7\%$, $p = 0.002$). In the model, only living arrangements and employment status were significantly uniquely associated with the PSQI score ($p < 0.05$). That is, living with someone (versus living alone) and being employed for wages were significantly associated with better sleep quality. In an additional analysis testing a potential effect of interactions between/among covariates on the PSQI score, we did not find any unique contribution of non-significant predictors to the PSQI score. We also tested potential collinearity between the GDS and PROMIS global mental health scores, given overlapping aspects of psychological symptoms. However, these two variables were only moderately correlated ($r = -0.55$, $p < 0.001$) and were not related to the PSQI score in the regression model, when considered individually or together.

Discussion

This study explored factors related to self-reported sleep quality among older Korean immigrants. We hypothesized that acculturation would be associated with sleep quality

Table 1 Study Participant Characteristics (N=43)

	Mean (SD)/ Frequency (%)	Observed Range
Age, years	72 (7)	59–85
Gender		
Men	18 (42%)	
Women	25 (58%)	
Marital status		
Married	25 (58%)	
Divorced	8 (19%)	
Widowed	10 (23%)	
Living situation		
Living in their own home/apartment	36 (84%)	
Living in the home/apartment of someone else	6 (14%)	
Living arrangement		
Living alone	15 (35%)	
Living with spouse	18 (42%)	
Living with spouse and others	6 (14%)	
Living with their child and other family	2 (5%)	
Living with other(s)	2 (5%)	
Duration of residing in the United States, years	37 (10)	< 1–55
Levels of education		
Some high school	1 (2%)	
High school graduate	10 (23%)	
Business/vocational school	1 (2%)	
Some college	7 (16%)	
College graduate	20 (47%)	
Graduate or professional education	3 (7%)	
Employed for wages	15 (35%)	
Annual household income		
< = \$10,000	4 (9%)	
\$10,001-\$20,000	11 (26%)	
\$20,001-\$30,000	4 (9%)	
\$30,001-\$40,000	5 (12%)	
\$40,001-\$50,000	2 (5%)	
\$50,001-\$100,000	3 (7%)	
> = \$100,001	4 (9%)	
Medical comorbidity		
High blood pressure	19 (44%)	
Diabetes	15 (35%)	
Body mass index	24.40 (3.51)	17.6–31.2
Geriatric Depression Scale total score	4.05 (3.00)	0–11
PROMIS Global Health score		
Physical health	46 (7)	32–58
Mental health	48 (4)	39–59
Short Acculturation Scale mean score	1.48 (0.39)	1.00–2.50
Subscale 1: Language use	1.30 (0.33)	1.00–2.20
Subscale 2: Media use	1.35 (0.60)	1.00–3.67
Subscale 3: Ethnic social relations	1.83 (0.52)	1.00–3.25
DBAS mean score	5.14 (2.03)	1.06–9.13
Subscale 1: Consequences	5.53 (2.17)	0.60–9.40
Subscale 2: Worry/helplessness	4.71 (2.36)	0–9.17
Subscale 3: Expectation	7.10 (2.79)	0–10
Subscale 4: Medication	4.07 (2.75)	0–9.33

DBAS Dysfunctional Beliefs and Attitudes about Sleep, *PROMIS* Patient-reported Outcomes Measurement Information System

Table 2 Descriptive Statistics for Sleep Measures (N = 43)

Sleep	Mean (SD)/ Frequency (%)	Observed range
Pittsburgh Sleep Quality Index total score	6.65 (4.29)	0–17
Factor 1 (sleep efficiency)	1.79 (1.90)	0–6
Factor 2 (perceived sleep quality)	3.02 (2.29)	0–8
Factor 3 (daily disturbances)	1.83 (1.04)	0–5
Medical Outcomes Study Sleep Scales		
Sleep disturbance	23.72 (23.57)	0–90
Snoring	21.86 (28.22)	0–100
Awakening short of breath or with headache	4.12 (10.29)	0–40
Sleep adequacy	58.84 (33.75)	0–100
Daytime somnolence	24.19 (17.09)	0–60
Sleep optimum (7–8 h of sleep)	18 (41.86%)	
Sleep problems index	24.03 (17.35)	2.22–66.67
Epworth Sleepiness Scale total score	5.42 (4.06)	0–18
STOP score ≥ 2	22 (51%)	0–3

based on prior findings of sleep disparities for race/ethnic minority immigrants; however, we did not find such a relationship. In contrast to our results, prior studies found a significant relationship between acculturation and sleep. In a large cohort study, greater U.S. acculturation was significantly associated with better self-reported sleep among first generation older Latinos [46]. In other studies [47, 48], however, Latinas with high acculturation were more likely to report sleep disturbances. In a multiethnic study [49], U.S.-born Hispanic/Latina, Chinese, and Japanese women reported more sleep complaints than their first-generation counterparts. However, language acculturation mediated the relationship between immigrant status and sleep (i.e., those who used English more than their native language showed poorer sleep), suggesting that first-generation immigrants who are linguistically less acculturated may sleep better. Based on the mean score of the SAS-K (and despite living in the U.S. for more than three decades on average), our study participants showed low acculturation (homogeneous in terms of U.S. acculturation). The limited variance in acculturation is consistent with studies of other racial/ethnic minority groups who are older adults [46]. Low acculturation in our study may be explained by the fact that most of older Korean immigrants came to the U.S. when they were adults after their cultural orientation was already set by the Korean culture. Another possible explanation of our finding could be because unmeasured domains of acculturation such as attitudes toward family, cultural activity, or traditional health beliefs and practice may play a role on their perceived sleep [50, 51]. While low levels of acculturation may be a source of stress for some immigrant communities, it may not be a course of stress for older Korean Americans living in Southern California.

We found that women, living alone, not being employed, having more depressive symptoms, and worse mental health

were significantly associated with poorer sleep quality. Our findings are consistent with prior studies of Korean immigrants in the U.S. For example, a significant association between depression and sleep was reported in a study [19] of 675 Korean older immigrants. Sleep disturbances have been found to increase the risk of developing depression and vice versa [52]. This bidirectional relationship suggests a critical need to address both conditions among older adults. Given the evidence showing that depression among Korean immigrants was high (49%) [53] but they tend to use mental health services less [54, 55], further studies are needed to understand how poor sleep affects depressive symptoms among this subgroup.

Our study also found significant relationships between sleep-related beliefs and perceived sleep quality. However, sleep-related beliefs did not significantly predict sleep quality when controlling for other variables. Nevertheless, to our knowledge, this is the first study to explore the interaction between sleep-related beliefs and sleep quality in any Asian American group. Only a few studies explored sleep-related beliefs among other racial/ethnic minority groups. Blacks with high risk of obstructive sleep apnea had higher dysfunctional sleep-related beliefs than those without the high risk of sleep apnea [56]. In another study, older Black women were more likely to endorse beliefs and attitudes about sleep that reflected a lack of understanding about the importance of sleep than older White women [57].

New Contributions to the Literature

Our study found significant contribution of living alone (versus living with someone) and being employed for wages (versus not) with self-reported sleep among older Korean immigrants. A prior study of Hispanic/Latino adults found insomnia severity was significantly associated with

Table 3 Associations Between the PSQI Total Score and Participant Characteristics (N=43)

	PSQI total score Mean (SD)	P-value
Gender		0.008
Male (n = 18)	4.67 (2.79)	
Female (n = 25)	8.08 (4.65)	
Marital status		0.094
Married (n = 25)	5.72 (3.96)	
Divorced/widowed (n = 18)	7.94 (4.50)	
Living situation		0.544
Living at their own home/apartment (n = 36)	6.64 (4.42)	
Living at someone's place (n = 6)	5.50 (2.43)	
Living arrangement		0.0005
Living alone (n = 15)	9.60 (4.20)	
Living with someone (n = 28)	5.07 (3.47)	
Medical comorbidity		
High blood pressure (n = 19)	7.84 (4.69)	0.106
Diabetes (n = 15)	5.80 (4.13)	0.347
Employed		0.0003
No (n = 28)	8.29 (4.19)	
Yes (n = 15)	3.60 (2.47)	
	Pearson correlation coefficient	
Age	0.215	0.167
Duration of residing in the United States	0.209	0.180
Levels of education	0.008	0.958
Annual household income	- 0.317	0.072
Body mass index	- 0.080	0.615
Geriatric Depression Scale total score	0.421	0.005
PROMIS global physical health	- 0.290	0.059
PROMIS global mental health	- 0.372	0.014
Short Acculturation Scale mean score	- 0.115	0.462
DBAS mean score	0.421	0.005
Epworth Sleepiness Scale total score	0.200	0.199

PSQI Pittsburgh Sleep Quality Index, PROMIS Patient-reported Outcomes Measurement Information System, DBAS Dysfunctional Beliefs and Attitudes about Sleep

Higher Geriatric Depression Scale score indicates worse depressive symptoms; higher PROMIS scores indicate better physical and mental health; higher Short Acculturation Scale score indicates greater acculturation to the United States culture; higher DBAS score indicates more dysfunctional beliefs about sleep; higher Epworth Sleepiness Scale indicates more daytime sleepiness

acculturation stress among those who were unemployed relative to their employed counterparts [58]. This suggests sociocultural impact on sleep among racial/ethnic minority groups and that employment may be moderating this process. Being employed for wages may also contribute to stronger daily rhythms (e.g., less daytime napping).

Table 4 A Regression Model Predicting PSQI Total Score Among Older Korean Immigrants (N=43)

Independent variables	PSQI total score	
	β (95% CI)	P value
Age	- 0.05 (- 0.26, 0.16)	0.618
Female gender	0.02 (- 3.52, 3.57)	0.990
Married	- 2.65 (- 6.60, 1.29)	0.180
Living with someone	- 5.13 (- 9.01, - 1.25)	0.011
Employed	- 3.45 (- 6.23, - 0.67)	0.016
Geriatric Depression Scale total score	0.23 (- 0.33, 0.80)	0.406
PROMIS global physical health	0.07 (- 0.14, 0.27)	0.513
PROMIS global mental health	- 0.06 (- 0.44, 0.29)	0.718
DBAS mean score	0.28 (- 0.45, 1.01)	0.438
F(9, 33) = 3.95; P < 0.01; R ² = 51.8%; Adjusted R ² = 38.7%		

DBAS Dysfunctional Beliefs and Attitudes about Sleep, PROMIS Patient-reported Outcomes Measurement Information System

Higher Geriatric Depression Scale score indicates worse depressive symptoms; higher PROMIS scores indicate better physical and mental health; higher DBAS score indicates more dysfunctional beliefs about sleep

Living alone among less acculturated, older Korean immigrants may contribute to social isolation, loneliness, or it may worsen psychological symptoms (e.g., depression), leading to poor sleep. Other possible reasons explaining this result could include the unique contribution of psychosocial stressors, neighborhood context (both physical and social), and socioeconomic status among this group [58–60].

Our findings also indicate that more than a half of older Korean immigrants report poor sleep quality (measured with the PSQI), and this is worse than what has been reported in younger Korean American women [20], other Asian Americans, Hispanic, and non-Hispanic Whites in the U.S [15]. However, symptoms of poor sleep measured with the MOS-Sleep were not worse than those in the U.S. general population [40]. While data on the PSQI score in the U.S. general population are lacking, further testing of various sleep assessment tools is warranted across different minority subgroups. The PSQI measures psychological characteristics related to sleep rather than actual sleep characteristics themselves that objective sleep tools measure [61]. This may be explained by its significant relationship with depressive symptoms and mental health in this study. Studies also showed greater discrepancy (night-to-night variability) between self-reported and objectively measured sleep characteristics among older adults with insomnia [62, 63]. Therefore, it is important to assess sleep using both subjective and objective tools among Korean immigrants with sleep complaints in the future studies.

This study was among the first to explore factors related to self-reported sleep, using a standardized measure (PSQI),

targeting older Korean immigrants. Surprisingly, despite the growing number of older adult Korean immigrants in the U.S., an intervention program addressing sleep problems is lacking. Future study with a larger sample is needed to identify optimal types of sleep intervention programs tailored to the needs of this group. Older Korean immigrants who are living alone should also be a target for intervention as they may be at high risk of poor sleep. Sleep programs focusing on sociocultural approach (e.g., increasing social support via community centers or church) may be most likely to be effective for this group.

Limitations

Despite strengths of our study, it had several limitations. Our study consisted of a very small convenience sample in a limited geographic area. Thus, the findings may not be generalizable to other Korean community groups in the U.S., particularly those living in the mainstream and outside the ethnic enclave. Due to cross-sectional nature of this study, causal relationship cannot be established. Part of our data collection was conducted during the COVID-19 pandemic via phone, thus sleep data collected during that time period may have overestimated the severity of perceived sleep and depressive mood symptoms. Sleep data were collected based on retrospective self-report only. The STOP questionnaire was developed for and validated in surgical patients at pre-operative clinics [37], thus, using this tool may not be applicable to our study participants. It is possible that persons with poorer sleep may be more inclined to participate in the study, resulting in potential bias of recruitment. Another limitation is low participation rate (39%). Although the RA was bilingual and our community partner took part in the recruitment, the recruitment duration was relatively short to build trusting relationship with the potential participants in this community. Moreover, fear of infection from the COVID-19 and the county department's stay-at-home order precluded from conducting further recruitment approaches involving in-person recruitment. Future studies need to perform various recruitment efforts to increase participation in this minority group.

In summary, findings of our study suggest importance of assessing factors related to poor sleep among older Korean immigrants, particularly socioeconomic characteristics including living arrangement and employment status. Further research is warranted to confirm our results in a larger population.

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Authors' contribution I further certify that all of authors have had substantive involvement in the preparation of this manuscript. Dr. Song (first and corresponding author of this paper) designed the study, analysed and interpreted the data, and prepared this manuscript. Drs. Martin, Kramer, Ryan, Hays, and Choi involved in designing the study, interpreting the data, and preparing the manuscript. Ms. Lee involved in interpreting the data and preparing the manuscript. All authors reviewed the submitted manuscript and approved this manuscript for submission. A part of this work was presented at the National Hartford Center of Gerontological Nursing Excellence Annual Leadership Conference, October 2020.

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Data availability The authors listed in this manuscript have full control of all primary data and that we agree to allow the journal to review our data if requested. The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest The authors have no relevant financial or non-financial interests to disclose.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by the University of California, Los Angeles Institutional Review Boards-South General Institutional Review Board (IRB No. 19-000647).

Informed Consent to participate Informed consent was obtained from all individual participants included in the study.

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