Original Research

HIV-Related Health Status, Adherence, and Stress Coping Capacity among Men Living with HIV in Japan

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▌ ABSTRACT ▌

Object: The aim of this study was to ascertain the associations between human immunodeficiency virus (HIV)-related health status and stress coping capacity, and between adherence to taking medicine and stress-coping capacity among men living with HIV in Japan.

Methods: This study used data from the HIV Futures Japan national survey, which is an online cross-sectional design survey. This survey of people living with HIV in Japan was conducted from July 2013 to February 2014. Invalid responses were eliminated, resulting in 913 valid responses. The current study analyzed responses from 870 men under the age of 65. The mean age (SD) of those respondents was 38.2 years (8.0). The 13-item Sense of Coherence scale (SOC-13) was used as a stress-coping capacity indicator. The Hospital Anxiety and Depression Scale (HADS) was used to measure mental health status. Respondents were divided into two groups for analysis: those who tested HIV-positive less than four years earlier and those who tested positive more than four years earlier.

Results: A significant association between one's CD4 cell count, viral load, and adherence and one's score on the SOC-13 was not noted. Partial correlation analysis was performed, controlled for years since testing HIV-positive and personal income, and significant correlations were found (p<.001). Testing HIV-positive less than 4 years earlier (ϱ=−.57) and testing HIV-positive more than 4 years earlier (−.60) were inversely associated with the HADS-A score, and testing HIV-positive less than 4 years earlier (ϱ=−.54) and testing HIV-positive more than 4 years earlier (ϱ=−.62) were inversely associated with the HADS-D score.

Conclusion: The current results revealed that the salutogenic model is applicable to individuals living with HIV. A program must be created to improve the stress coping capacity of people living with HIV.

Keywords
Stress coping capacity; Salutogenesis; Socioeconomic status; HIV-related health status; Adherence.

Abbreviations
HIV: Human Immunodeficiency Virus; HADS: Hospital Anxiety and Depression Scale; SOC-13: 13-item Sense of Coherence; HFJ: HIV Futures Japan; QoL: Quality of Life.

INTRODUCTION

Since 2007, around 1,500 HIV/AIDS cases have been reported annually in Japan. In 2016, 1,011 HIV (965 males; 46 females) and 437 AIDS (415 males; 22 females) cases were reported.[1] In Japan, over 70% of individuals living with HIV have anxiety or stress,[2] and people living with HIV have many psychosocial stressors from external and internalized stigma.[3,4] In Japan, 86.9% of people living with HIV experience internalized stigma.[5] Moreover, 41.7% of people living with HIV in Japan have mental health problems[5] and a significantly higher proportion of individuals living with HIV have depressive or anxious tendencies in comparison to the general population.[2,5]

According to several researchers who examined inner strength concepts, resilience, sense of coherence (SoC), hardiness, purpose in life, and self-transcendence were introduced as typical concepts.[6,7] Here, we focused on SoC as an indicator of one's stress coping capacity because it is a core concept of the salutogenic model, which was structured on the bases of stress-related models such as the stress appraisal model, the stress process model and so on.[8] A SoC is the capacity to manage stressors by maintaining harmony with the whole environment.[8]

Evidence from the general population indicates that a low SoC predicts the incidence of illness and death,[9-12] and a study has found that SoC is closely associated with health.[13] In addition, several studies have noted a close relationship between quality of life (QoL) for patients with a chronic condition such as lung or breast cancer and their SoC.[14-18]

Few studies have examined SoC in individuals living with HIV. Previous studies on the association between health status and health behaviors and SoC have yielded the following findings: The SoC of people living with HIV is associated with health-related QoL for both men and women,[19] is inversely associated with how often patients forget to take their anti-HIV medications[20]; is inversely associated with HIV-related symptoms, depressive tendencies, and anxious tendencies[21]; is associated with general health status, activity, and positive well-being[21]; is not associated with CD4 cell count[21]; and is inversely associated with negative emotions but associated with positive emotions and psychological well-being.[22]

The current study used national survey data to examine the SoC as an indicator of one's stress coping capacity in Japanese men living with HIV. The aim of this study was to ascertain the association between stress coping capacity and health status (CD4 cell count and viral load), adherence to treatment (how often patients forgot to take anti-viral agents), and mental health.

METHODS

HIV Futures Japan national online survey (HFJS)

This study used data from the HFJS, which was a study with a cross-sectional design that was conducted from July 2013 to February 2014. The HFJS was a large online survey that was conducted as part of the HIV Futures Japan (HFJ) project.[23] The HFJ project

is one involving the participation and cooperation of numerous individuals living with HIV. Modeled on the HIV Futures project in Australia, the HFJ project is intended to help individuals living with HIV lead a healthier personal lifestyle and to create livable conditions for those individuals. Many individuals living with HIV in Japan have been surveyed on various scales, but those surveys were all conducted through medical facilities and they covered information of interest to medical personnel. The distinct QoL and needs of individuals living with HIV have yet to be ascertained.

Thus, a multifaceted and multidisciplinary study of the lives of individuals living with HIV based on a stakeholder participatory approach[24] was planned. In 2012, four groups were formed. Twenty individuals living with HIV were assembled from throughout Japan to serve as a "reference group"; 10 researchers were assembled into a "research group"; researchers, relevant individuals, and web specialists were assembled into a five-person "web group" to conduct an online survey; and researchers and relevant individuals were assembled into a three-person "steering group" to oversee the other three groups. Each group met online or face-to-face about 250 times. The groups came together in three joint meetings prior to the survey, where they discussed the survey content. The survey contained a total of 350 questions that asked for information in the following 10 general categories: (1) sociodemographic and socioeconomic characteristics, (2) health status, (3) medical care and outpatient visits, (4) sexual health, (5) substance abuse and addiction, (6) children, (7) social relationships, (8) mental health, (9) health management and welfare, and (10) other information.

Subjects and Methods

For this study, an open online survey based on one's self-reported HIV status was conducted. Subjects were recruited using the following two methods: The first method involved approaching potential subjects online. A general portal site was created to provide information to individuals living with HIV, and the portal site linked to a survey site. Links and banner notices were placed on the websites of HIV prevention and education groups and support groups for individuals living with HIV throughout Japan. Twitter and Facebook accounts were also created, and periodic notices were sent out. The second method involved handing out flyers. A flyer listing the URL of the survey site was created and distributed to HIV-treatment facilities nationwide and in public forums where information on HIV and prevention was provided.

A requirement for survey participation was that the respondent clearly indicate where and when he tested HIV-positive.

Invalid responses were eliminated, resulting in 913 valid responses. Respondents were from all prefectures in Japan except Tottori Prefecture. The current study analyzed responses from 870 men under the age of 65 who also completed the 13-point Sense of Coherence scale (SOC-13). The mean age (SD) of those respondents was 38.2 years (8.0) as shown in Table 1, and 48 of those respondents (5.5%) were heterosexual. In a previous study conducted at a medical facility, subjects had a mean age (SD) of 44.6 years (11.3),[25] so subjects in the current study were slightly younger. A somewhat higher percentage of the current subjects

were gay or bisexual compared to all individuals living with HIV in Japan.

Also, encrypted communication by Secure Sockets Layer was performed in this online survey for security. This study was approved by the institutional review board of the author's organization.

Variables

Stress coping capacity

The current study used the Japanese version of the SOC-13. Responses to each item are selected on a 7-point semantic differential scale. The Japanese version of the SOC-13 has a similar level of reliability and validity compared to the original SOC-13.[26,27] The range of scores was 13-91 points. A higher score indicates a stronger SoC. In the current study, Cronbach's α was 0.82.

Demographic characteristics

Years since testing HIV-positive: Respondents were asked, "When did you learn that you were infected with HIV?" and were instructed to respond with the specific year. This value was converted to the number of years prior to the survey. Based on the distribution of this value, responses were classified into the following four categories: "less than 4 years," "4 to 10 years," "10 to 20 years," and "over 20 years."

Personal income: Annual personal income in 2012 was classified into the following five categories: "less than 1 million yen," "1 to 3 million yen," "3 to 5 million yen," "5 to 8 million yen," and "more than 8 million yen."

HIV-related health status and health behaviors

Respondents were asked to recount their latest laboratory results. A study has reported that a self-reported CD4 cell count has a sensitivity (95% CI) of 82% (68-88%) and a self-reported viral load has a sensitivity (95% CI) of 93% (84-97%).[28]

CD4 cell count: The CD4 cell count was classified into the following four categories: "200 cells/μL or lower," "200-350 cells/μL," "351-500 cells/μL," and "501 cells/μL or higher."

Viral load: The viral load was classified into four categories: "below the limit of detection," "less than 10^3 copies/ml," "10^3-10^5 copies/ml," and "10^5 copies/ml or greater."

Adherence to anti-HIV medication: Respondents were asked, "How many times have you forgotten to take your anti-HIV medication over the last month? This means that you forgot completely. Do not include times when you initially forgot but took your medication later." Responses were classified into seven categories: "have never forgotten," "once," "2-4 times," "5-9 times," "10 or more times," "took medication in the past but not taking medication now," and "not taking medication."

Mental health/well-being

Depression and anxiety: The current study used the Japanese version of the Hospital Anxiety and Depression Scale (HADS).[29] The reliability and validity of the Japanese version have been verified.[30] The HADS consists of a total of 14 items, with seven items related to anxiety (HADS-A) and seven items related to depression

(HADS-D). Responses to each item are given on a 4-point Likert scale from 0-3 points. In the current study, the total scores for the HADS-A and HADS-D were treated as continuous variables (range of 0-21 points for each). A higher score indicates greater anxiety or depression. Cronbach's α for the HADS-A and HADS-D were 0.85 and 0.75, respectively.

Satisfaction with one's sex life: Respondents were asked, "How satisfied are you with your current sex life?". Four responses were possible: "not satisfied at all," "largely unsatisfied," "somewhat satisfied," and "quite satisfied."

Statistical Analysis

The relationship between SoC and health status, adherence to anti-HIV medication, and mental health and well-being is potentially confounded by the years since testing HIV-positive, so respondents were divided into two groups for analysis based on frequently distribution and practical experience of self-care support, namely, those who tested HIV-positive less than 4 years earlier and those who tested positive more than 4 years earlier. The estimated marginal (EM) means and 95% confidence interval were determined using a fixed effect model with the SOC-13 as a dependent variable. In that instance, years since testing HIV-positive and personal income served as covariates in the adjusted model. The relationship between mental health and well-being and the SOC-13 was examined using partial correlation analysis with years since testing HIV-positive and personal income serving as control variables. The above analyses were performed using IBM SPSS Statistics version 22, and the level of statistical significance was 5%.

RESULTS

Descriptive statistics in this survey were shown in Table1.

Table 2 shows the distribution of responses regarding HIV-related health status and health behaviors and mental health and well-being for two groups of respondents, i.e., those who tested HIV-positive less than 4 years earlier and those who tested HIV-positive more than 4 years earlier. An χ²-test based on when respondents tested HIV-positive yielded significant results for the CD4 cell count, viral load, and adherence to anti-HIV medication. A t-test indicated that respondents who tested HIV-positive less than 4 years earlier had a significantly lower HADS-A score than respondents who tested HIV-positive more than 4 years earlier had (*p*=.003). Respondents who tested HIV-positive less than 4 years earlier had a mean (SD) score on the SOC-13 of 49.9 points (12.5) while respondents who tested HIV-positive more than 4 years earlier had a mean score of 51.6 points (13.2). A t-test indicated a slightly significant difference in the mean scores on the SOC-13 for the two groups of respondents (*p*=0.059).

The EM means by category indicating the association between the SOC-13 and HIV-related health status and health behaviors are shown in Table 3. After adjusting for years since testing HIV-positive and personal income, multiple comparisons of scores on the SOC-13 were performed in relation to each category. No combinations resulted in statistically significant differences in

Table1. *Descriptive statistics by individual attributions*

		n (%)
Years since testing HIV-positive		
a.	less than 4 years	351 (40.3)
b.	4 to 10 years	354 (40.7)
c.	10 to 20 years	141 (16.2)
d.	over 20 years	22 (2.5)
Personal annual income (in yen)		
a.	<1 million	137 (15.7)
b.	1-2.99 million	277 (31.8)
c.	3-4.99 million	268 (30.8)
d.	5-7.99 million	124 (14.3)
e.	≥8 million	47 (5.4)
f.	No answer	17 (2.0)
Age mean±SD		38.2±8.0
Total		870

Table 2. *Frequency Distribution by HIV Related Health Status and Behavior*

	Total	Years passed since tested positive for HIV		
		Less than 4 years	More than 4 years	*p*
	n (%)	n (%)	n (%)	
CD4 cell count				
~200/μL	116 (13.3)	68 (19.4)	48 (9.3)	<.001[1]
201~350/μL	152 (17.5)	88 (25.1)	64 (12.4)	
351~500/μL	196 (22.5)	73 (20.8)	122 (23.6)	
501/μL~	360 (41.4)	96 (27.4)	264 (51.1)	
DK/missing	46 (5.3)	26 (7.4)	19 (3.7)	
Viral load				
below the limit of detection	475 (54.6)	126 (35.9)	348 (67.3)	<.001[1]
less than 103 copies/mL	149 (17.1)	77 (21.9)	72 (13.9)	
103-105 copies/mL	122 (14.0)	81 (23.1)	41 (7.9)	
more than 105 copies/mL	36 (4.1)	18 (5.1)	18 (3.5)	
DK/missing	88 (10.1)	49 (14.0)	38 (7.4)	
Adherence to anti-HIV medication				
never forgotten	491 (56.4)	200 (57.0)	291 (56.3)	<.001[1]
once	115 (13.2)	28 (8.0)	86 (16.6)	
2-4 times	100 (11.5)	23 (6.6)	77 (14.9)	
5-9 times	30 (3.4)	10 (2.8)	20 (3.9)	
10 or more times	13 (1.5)	4 (1.1)	9 (1.7)	
took medication in the past	10 (1.1)	5 (1.4)	5 (1.0)	
not taking medication	103 (11.8)	77 (21.9)	25 (4.8)	
DK/missing	8 (0.9)	4 (1.1)	4 (0.8)	
HADS-A (mean±SD)	8.6±4.8	9.2±4.6	8.2±4.9	.003[2]
HADS-D (mean±SD)	8.1±4.2	8.2±4.0	8.1±4.4	.718[2]
Satisfaction with one's sex life (mean±SD)	2.9±0.8	2.9±0.8	2.8±0.8	.444[2]
SOC-13 (mean±SD)	50.9±13.0	49.9±12.5	51.6±13.2	.059[2]

DK Do not know
HADS; Hospital Anxiety and Depression Scale
HADS-A; HADS subscales for Anxiety
HADS-D; HADS subscales for Depression
SOC; Sense of Coherence
(1) chi-square test
(2) student t test

Table 3. *Estimated Marginal Mean of Sense of Coherence Score by HIV Related Health Status and Behavior*

	Since tested positive for HIV			
	Less than 4 years (n=351)		More than 4 years (n=517)	
		95% CI		95% CI
	EMmean	[Lower, Upper]	EMmean	[Lower, Upper]
CD4 cell count				
~200/μL	48.37	[45.38, 51.37]	55.65	[51.97, 59.33]
201~350/μL	50.11	[47.51, 52.72]	50.27	[47.07, 53.46]
351~500/μL	49.69	[46.83 ,52.54]	51.62	[49.31, 53.93]
501/μL~	51.27	[48.74 ,53.80]	51.10	[49.53, 52.67]
DK/missing	48.33	[43.49, 53.16]	51.68	[45.83, 57.53]
Viral load				
below the limit of detection	51.00	[48.70, 53.30]	51.64	[50.27, 53.02]
less than 10^3 copies/mL	49.95	[47.16, 52.73]	51.13	[48.10, 54.16]
10^3~10^5 copies/mL	49.09	[46.29, 51.88]	49.20	[45.18, 53.22]
more than 10^5 copies/mL	47.06	[41.29, 52.82]	52.30	[46.24, 58.36]
DK/missing	49.18	[45.58, 52.78]	53.85	[49.70, 58.00]
Adherence to anti-HIV medication				
never forgotten	50.97	[49.24, 52.70]	51.34	[49.84, 52.84]
forgotten once over the last month	49.27	[44.66, 53.88]	54.53	[51.78, 57.28]
forgotten 2-4 times over the last month	48.71	[43.60, 53.81]	50.62	[47.72, 53.53]
forgotten 5-9 times over the last month	48.78	[41.06, 56.50]	48.68	[42.97, 54.39]
forgotten 10 or more times over the last month	34.93	[22.76, 47.10]	54.75	[46.26, 63.24]
had taken medication in the past	46.11	[35.24, 56.98]	42.59	[31.14, 54.03]
not taking medication	48.84	[45.94, 51.73]	49.46	[44.32, 54.60]
DK/missing	48.46	[36.32, 60.60]	53.70	[40.97, 66.43]

Adjusted for years passed since tested positive for HIV and personal annual income
All maltiple comparisons (by sidak test) were not siginificant(p>0.10)
EMmean; Estimated marginal mean

the score on the SOC-13. However, in the current sample, respondents who tested HIV-positive less than 4 years earlier, who had a CD4 cell count of "501 cells/μL or higher," who had a viral load "below the limit of detection," and who had "never forgotten" to take their anti-HIV medication had higher scores on the SOC-13 (Figure 1). Respondents who tested HIV-positive more than 4 years earlier, who had a CD4 cell count of "200 cells/μL or lower," who had a viral load of "10^5 copies/ml or greater," and who had forgotten "10 or more times" to take their anti-HIV medication had higher scores on the SOC-13.
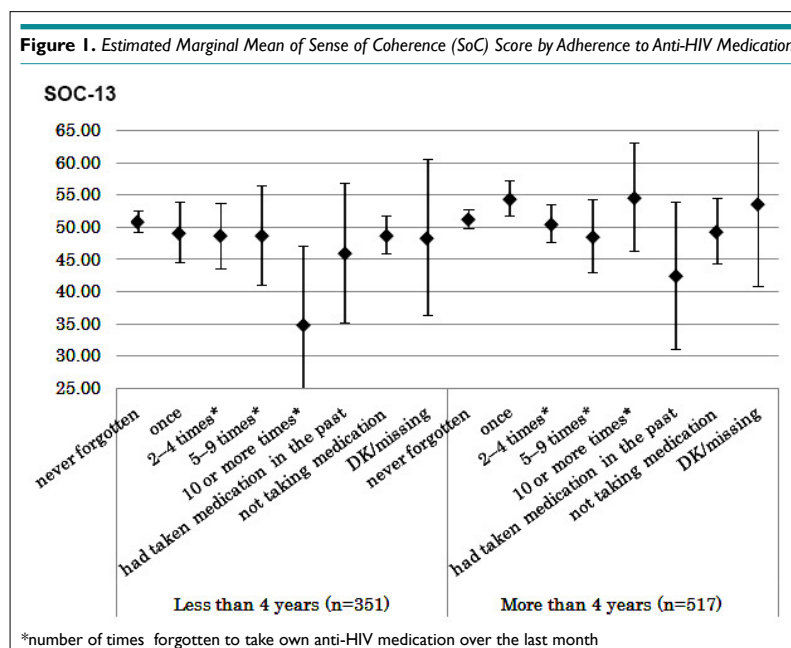

Figure 1. *Estimated Marginal Mean of Sense of Coherence (SoC) Score by Adherence to Anti-HIV Medication*

*number of times forgotten to take own anti-HIV medication over the last month

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Table 4. *Partial Correlation Analysis between Sense of Coherence Score and Mental Health*

| | Since tested positive for HIV | | | |
| | Less than 4 years | | More than 4 years | |
	$\rho^{1)}$	P	$\rho^{1)}$	P
HADS-A	-0.57	<.001	-0.60	<0.001
HADS-D	-0.54	<.001	-0.62	<0.001
Satisfaction with one's sex life	0.30	<.001	0.32	<0.001

HADS; Hospital Anxiety and Depression Scale
HADS-A; HADS subscales for Anxiety
HADS-D; HADS subscales for Depression
$^{1)}$ Partial correlation coefficient controlled for years passed since tested positive for HIV and personal annual incom

Results of partial correlation analysis of the association between the SOC-13 and mental health and well-being are shown in Table 4. A significant association between the SOC-13 and each variable (*p*<.001) was noted in both respondents who tested HIV-positive less than 4 years earlier and respondents who tested HIV-positive more than 4 years earlier, independent of when they tested HIV-positive and their personal income. Testing HIV-positive less than 4 years earlier (ϱ=-0.57) and testing HIV-positive more than 4 years earlier (-0.60) were inversely associated with the HADS-A score, and testing HIV-positive less than 4 years earlier (ϱ=-0.54) and testing HIV-positive more than 4 years earlier (ϱ=-0.62) were inversely associated with the HADS-D score. Testing HIV-positive less than 4 years earlier (ϱ=0.30) and testing HIV-positive more than 4 years earlier (ϱ=0.32) were associated with satisfaction with one's sex life.

DISCUSSION

An association between the CD4 cell count and viral load and the score on the SOC-13 was not noted in either respondents who tested HIV-positive less than 4 years earlier or respondents who tested HIV-positive more than 4 years earlier. The lack of an association between the CD4 cell count and SoC is similar to the results of a previous study.[22] The current results revealed no direct relationship between HIV activity and SOC. In the current sample, the distribution of scores on the SOC-13 differed slightly (albeit not significantly) for respondents who tested HIV-positive less than 4 years earlier and respondents who tested HIV-positive more than 4 years earlier. In other words, respondents who tested HIV-positive less than 4 years earlier, who had a high CD4 cell count, and who had a low viral load, had a high SoC. Respondents who tested HIV-positive more than 4 years earlier, who had a low CD4 cell count, and who had a high viral load, had a high SoC. Thus, an inverse distribution was apparent. This finding may be the result of a relationship between adherence to anti-HIV medication and SoC, as will be described next.

An association between close adherence to anti-HIV medication and the score on the SOC-13 was not noted, independent of years since testing HIV-positive. According to Antonovsky, individuals with a higher SoC are more likely to engage in behaviors and practices that benefit health.[8] In the current sample, respondents who tested HIV-positive less than 4 years earlier and who never forgot to take their medication had the highest scores on the SOC-13. In contrast, respondents who had forgotten to take their medication 10 or more times had the lowest scores on the SOC-13. This finding substantiates Antonovsky's hypothesis. However, respondents who tested HIV-positive more than 4 years earlier and who forgot to take their medication 10 or more times in the last month had a high SoC. Respondents who had never forgotten to take their medication did not necessarily have a high SoC. The longer a respondent had been living with HIV, the higher that respondent's SoC. Respondents may have devised their own way to deal with HIV despite inaccurate information and incorrect knowledge.

Lastly, the more intense one's anxious tendencies and depressive tendencies are, the lower one's score on the SOC-13 is. Results revealed that the greater the satisfaction with one's sex life is, the higher one's score on the SOC-13 is. There was an association between satisfaction with one's sex life and one's score on the SOC-13, independent of years since testing HIV-positive. Previous studies have found an association between mental health and well-being and SoC in the general population and in patients with a chronic illness.[13,17] The current study confirmed this association in individuals living with HIV as well.

The current results revealed that Antonovsky's salutogenic model is applicable to individuals living with HIV. Salutogenesis and SoC are basic tenets of health promotion,[31] suggesting that both of these could be used to devise measures to help support individuals living with HIV.

The current study had a practical implication: A program must be created to improve the stress coping capacity of people living with HIV. The current study revealed that SoC has a strong relationship with mental health, and there were some little relationships between SoC and adherence to anti-HIV medication. SoC should be enhanced simultaneously with improvement of health literacy, as these are largely overlapping concepts.[32] Health education is an important way to improve health literacy based on the salutogenic model.[33] Thus, a program to improve the SoC of individuals living with HIV should be created with a focus on both SoC and health literacy.

The current study had three limitations: First, the study involved an open online survey. This study was not conducted by medical personnel such as physicians, so subjects included individuals who may have tested HIV-positive but who were not visiting a medical facility for treatment. This was an advantage, but

the resulting sample is composed of mostly younger individuals who were net-survey. In the future, relatively older age groups need to be surveyed. Second, "objective health indices" were based on self-reported responses. The responses may have underestimated the levels of those indices. In the future, evidence of the extent of any measurement bias due to self-reporting needs to be assembled, responses need to be corrected, and results need to be verified. Last, the current study was designed as a cross-sectional study. Accordingly, temporal causality could not be adequately ascertained. In the future, a longitudinal study should be conducted, temporal causality should be determined, and the reliability of that study's results should be examined.

FUNDING

COMPLIANCE WITH ETHICAL STANDARDS

Conflicts of Interest

The authors declare that they have no competing interests.

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.

Informed Consent

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

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