

# ASSESSMENT OF QUALITY OF LIFE AMONG PATIENTS WITH KNEE OSTEOARTHRITIS

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## Abstract:

**Introduction:** Osteoarthritis (OA) is a degenerative joint disease estimated to be the fourth leading cause of disability.

**Methodology:** We conducted a cross-sectional observational study at BSMMU, Dhaka, from April 2018 to March 2019. Our goal was to evaluate the quality of life in knee OA patients in Bangladesh using Short Form-36 (SF-36) Health Survey and Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index. We collected data through face-to-face interviews, adhering to specific inclusion and exclusion criteria.

**Results:** Most participants were within the 40-59 year age group, with 65.2% of patients reporting a disease duration of 1-5 years. The mean WOMAC scores differed significantly by age ( $p=0.001$ ), with older patients having higher scores. Gender and monthly income did not significantly impact WOMAC scores ( $p>0.05$ ). Educational status showed potential significance ( $p=0.074$ ), but it did not reach statistical significance. There was a strong statistical association between total WOMAC scores and patient age ( $p=0.001$ ). However, other socio-demographic factors showed no significant differences ( $p>0.05$ ). Patients with shorter OA knee durations (less than one year) had notably lower WOMAC scores than those with longer durations (1-5 years), with a significant difference ( $F=16.513$ ,  $p<0.001$ ). In terms of OA knee grading, patients with more severe OA (grade III) had significantly higher WOMAC scores than those with less severe OA (grade I or II) ( $F=190.077$ ,  $p<0.001$ ). Gender, educational status, and monthly income significantly influenced SF-36 scores in knee OA patients. Male patients and those with higher educational levels reported higher SF-36 scores. Monthly income also had a significant effect ( $F=6.101$ ,  $p=0.004$ ), with higher income linked to higher SF-36 scores. Age did not significantly impact SF-36 scores ( $F=0.492$ ,  $p=0.614$ ). Body mass index (BMI) did not significantly affect health-related quality of life in OA knee patients. The elderly with more advanced and prolonged disease had lower quality of life according to WOMAC.

**Conclusion:** It can be concluded that patients with OA knee had relatively poor quality of life in physical health component than that of mental health component and role physical domain was mostly affected among all domains.

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## Introduction

Osteoarthritis (OA) is the most prevalent degenerative joint disease that occurs primarily in older individuals<sup>1</sup>. Characteristics of biochemical and morphologic alterations in the synovial membrane and joint capsule explain the signs and symptoms of OA<sup>2</sup>.

Worldwide incidence is increasing due to increasing obesity and the ageing population<sup>3</sup>. In the United States, 27 million adults (more than 10% of the U.S. adult population) have

been suffering from clinical OA, and it is the fourth most common cause of hospitalization. OA is the leading indication for joint replacement surgery; 905,000 knee and hip replacements were performed in 2009 at \$42.3 billion<sup>4</sup>.

In Bangladesh, the prevalence of OA knee varies depending on the community, with higher rates found in urban areas<sup>5</sup>. It is estimated that during 2008–2040, the proportion of people aged 65 will increase by 26.1% in Bangladesh<sup>6</sup>.

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Osteoarthritis involving knee joints tends to increase their physical limitations, pain, and functional restrictions, including social activities and sleeping quality with disease progression. So, quality of life using WHO definition<sup>14</sup> is essential in management of OA. Short Form 36 (SF-36) was designed by the Medical Outcomes Study supported by the RAND Corporation. It is a reliable and validated generic instrument that has been used extensively to measure health-related quality of life in diverse groups<sup>7</sup>. It comprises 36 questions and eight domains with two physical and mental components<sup>8</sup>. Each domain generates a score from 0 to 100, with a high score indicating better health and a low score indicating worse health<sup>9</sup>.

The Western Ontario and McMaster (WOMAC) scale was designed to measure dysfunction and pain associated with osteoarthritis (OA) of the lower extremities. It is among the most sensitive instruments used in the assessment of OA of the knee or hip and has been widely used in clinical trials<sup>10</sup>. It evaluates pain, stiffness, and physical function with 5, 2 and 17 questions, respectively. The test questions are scored on a scale of 0-4, with a high score indicating worse health and a low score indicating better health<sup>11</sup>.

Assessing health-related quality of life (HRQOL) among patients with osteoarthritis (OA) helps the healthcare provider understand the disease's impact from the patient's perspective and makes health services more patient-centered.

In Bangladesh, studies are scarce on HRQOL among OA knee patients who identify the impact of the disease on their quality of life. The present study aimed to assess the quality of life of knee osteoarthritis patients using the Short Form-36 (SF-36) Health Survey questionnaire and the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index. This would help to identify patients' needs regarding both the physical and mental aspects of health in a low-resource country like us and implement cost-effective interventions, including both non-pharmacotherapy like patient education, weight loss regimens, exercises and pharmacotherapy that can improve all the affected domains of HRQOL of patients with OA knee.

## Materials and methods

### Participants

The study was a cross-sectional observational analytical study conducted in the period

between April 2018 to March 2019 in the Department of Physical Medicine and Rehabilitation, BSMMU, Dhaka.

Patients with osteoarthritis of the knee joint presenting in the Department of Physical Medicine and Rehabilitation, BSMMU, within the defined period, were the study population. A total of 66 patients of OA were enrolled in our study population after fulfilling the eligibility criteria.

## Objectives

### General objective

To assess the quality of life of knee osteoarthritis patients using the Short Form-36 (SF-36) Health Survey questionnaire and Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index

### Specific objectives

- To identify the most affected component (physical or mental) in patients with OA knee by SF-36 questionnaire
- To measure the symptoms and physical disability in patients with OA knee by WOMAC Index
- To find out the association between the scores of SF-36 domains and socioeconomic status, duration of disease, body mass index (BMI) and grading of the OA knee of the patients
- To find out the association between the scores of WOMAC dimensions and socioeconomic status, duration of disease, body mass index (BMI) and grading of the OA knee of the patients

### Selection criteria

Patients were selected through a purposive sampling technique based on inclusion and exclusion criteria.

### Inclusion criteria:

All OA patients according to ACR  
Willing to participate in the study.

### Exclusion criteria

1. Coexisting painful condition of lower limbs
2. Concurrent systemic inflammatory rheumatic disease
3. Medical comorbidity that would render the patient unable to participate fully in study procedures (e.g., terminal conditions such

as end-stage renal disease, heart failure or malignancy)

4. History of trauma to the knee joint
5. History of previous knee joint surgery
6. Patients were unwilling to participate or unwilling to give written consent.

### **Data collection**

Data from the respondents were collected through face-to-face interviews until the desired sample size was attained.

A semi-structured questionnaire was used to collect data regarding the patients' socio-demographic status and disease-related information. A structured and validated Bangla questionnaire of Medical Outcomes Study-36-Item Short Form Health Survey (SF-36) and Western Ontario and McMaster Universities Arthritis Index (WOMAC) was administered to collect information regarding the quality of life. The SF-36 is a multi-purpose, short-form health questionnaire. It yields an 8-scale profile of functional health and well-being scores. These scales include physical function, role limitations due to physical problems, bodily pain, vitality or energy level, role limitations due to personal or emotional problems, mental health, social function, and general health perception ranging from 0 ("maximal symptoms/maximal limitations/poor health") to 100 ("no symptoms/no limitations/ excellent health").

The physical function scale consists of ten items that ask about involvement in a range of activities such as running, playing, lifting heavy objects, climbing stairs, walking, and bathing, or dressing oneself. In addition, respondents are asked to rate on a 3-point scale and to the extent to which their health limited their ability to engage in the various activities over the past four weeks (1 limited a lot, two limited a little, and three not limited at all).

The pain scale consists of two items asking patients to rate pain severity over the past four weeks.

The vitality scale includes four questions which are rated on a 6-point scale.

The mental scale includes five items which are rated on a 6-point scale.

The social function scale includes two items rated on a 5-point scale.

The general health scale includes five questions rated on a 5-point scale.

Role limitations due to physical health and emotional problems include four and three items, respectively.

Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index

The assessment tool WOMAC assesses pain, stiffness, and physical function across three domains, encompassing 5, 2, and 17 questions, respectively. The WOMAC's Likert version employs an ordinal scale of 0 to 4, where lower scores denote less symptom severity or physical impairment. The cumulative score for each subscale ranges from 20, 8, and 68, respectively, constituting the maximum attainable score.

### **Data analysis**

The collected data was meticulously reviewed for consistency by manually checking and editing it before proceeding to tabulation. The coded data was entered and analyzed using the statistical package for social science (SPSS) version 24 software. The study findings were presented through tables and graphs displaying frequency and percentage distributions, with continuous variables represented using means and standard deviations and categorical variables depicted through frequency distributions. Each SF-36 scale was directly converted into a 0-100 scale to ensure that all questions carried equal weight. Similarly, the WOMAC test questions were scored between 0-4, with the values ranging from None (0) to Extreme (4). The data associations were evaluated using the Independent Sample t-test and one-way ANOVA test, where statistical significance was considered at  $p < 0.05$  with all p-values being two-sided.

### **Ethical consideration**

The primary objective of this research was to safeguard the human rights of all subjects. The data collected during the study was strictly used for the study's purpose and was not disclosed to anyone outside the research team. The Institutional Review Board (IRB) of Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh, granted approval initially. Moreover, written permission was obtained from the participants, along with a guarantee that their information would remain confidential.

The respondents were treated with respect, and their participation was entirely voluntary. They had the right to opt out at any point during the study without any negative consequences. The process of obtaining informed consent was appropriately documented. Every respondent was interviewed separately, and their privacy and confidentiality were stringently upheld.

### Operational definitions

**Health-related quality of life (HRQOL):** The concept of health-related quality of life encompasses those aspects of overall quality of life that can be clearly shown to affect health—either physical or mental<sup>16</sup>.

**Quality of life:** It is described as an individual's perception of his/her position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns<sup>14</sup>.

**OA:** According to the American College of Rheumatology (ACR)<sup>16</sup>, criteria for OA of knee

1. Knee pain for most days of the prior month
2. Radiographic osteophytes at the joint margin
3. Synovial fluid typical of osteoarthritis
4. Age equal to or greater than 40 years.
5. Morning stiffness equal to or less than 30 minutes
6. Crepitus with active joint motion

### Grading of OA<sup>17</sup>

grade 0 (none): definite absence of x-ray changes of osteoarthritis

grade 1 (doubtful): doubtful joint space narrowing and possible osteophytic lipping

grade 2 (minimal): definite osteophytes and possible joint space narrowing

grade 3 (moderate): moderate multiple osteophytes, definite narrowing of joint space and some sclerosis and possible deformity of bone ends

grade 4 (severe): large osteophytes, marked narrowing of joint space, severe sclerosis and definite deformity of bone ends

### Result:

**Table-I**  
*Demographic distributions of the participant (n=66)*

Age (in years)	Frequency (n)	Percentage (%)	Mean±SD
40-49	23	34.8	
50-59	24	36.4	
60-69	16	24.2	52.80±8.48
≥70	3	4.5	
Sex Male	17	40.9	
Female	49	59.1	
Educational Qualification			
Illiterate	15	22.7	
Primary incomplete	11	16.7	
Primary completed	21	31.8	
Up to secondary	9	13.6	
Above secondary	10	15.2	
Monthly family income			
<10,000	15	22.7	
10,000-20,000	39	49.1	
>20,000	12	18.2	
Duration (in years)			
<1 years	6	9.1	
1-5 years	43	65.2	
6-10 years	16	24.2	
>10 years	1	1.5	
BMI (in Kg/m <sup>2</sup> )			
Normal weight (18.5-24.9)	20	30.3	26.47±3.56
Overweight (25.0-29.9)	33	50.0	
Obese (≥30)	13	19.7	



The above table showed that among the patients, most of the participants were in middle aged majority of the patients had been suffering from OA about 1-5 years.

Among the patients, only a few percent of participants did not complete primary education but most of the participants were educated.

\* Physical component summary (PCS) scale and mental component summary (MCS) scale of the Short Form 36-item health status survey questionnaire

Mental health domain had the highest score followed by social functioning vitality pain, physical functioning.

**Table II**

*SF-36 scores of patients with OA knee (n=66)*

SF-36 scores	Mean ±SD
Physical Functioning	31.52 ± 18.75
Role Physical	23.86 ± 22.11
Pain	36.14 ± 18.89
Vitality	44.24 ± 20.91
Role Emotional	28.79 ± 33.53
Mental health	48.95 ± 22.51
Social Functioning	44.36 ± 21.36
General Health	27.87 ± 15.53
PCS*	29.85 ± 14.53
MCS*	33.65 ± 46.44

**Table III**

*WOMAC scores of patients with OA knee (n=66)*

WOMAC scores	Mean ±SD
Pain	6.14 ± 1.64
Stiffness	1.03 ± 0.43
Physical function	20.97 ± 2.83
WOMAC total	28.14 ± 3.99

Here the mean of total WOMAC was 28.14 ± 3.99.

**Table IV**

*Distribution of patients by WOMAC scores and socio-demographic status of the patients with OA knee (n=66)*

Socio-demographic status	WOMAC score (Mean ± SD)	Statistics#
Age (in years)	40-49(n=23)	F=8.454
	50-59 (n=24)	p=0.001
	≥60 (n=19)	
Gender	Male (n=27)	t=0.410
	Female (n=39)	p=0.683
Educational status	Illiterate(n=15)	F =2.423
	Primary incomplete(n=11)	p=0.074
	Primary completed(n=21)	
	Secondary and above (n=19)	
Monthly income(in taka)	<10,000 (n=15)	F=0.516
	10,000-20,000(n=39)	p=0.599
	>20,000 (n=12)	
Duration(in years)	<1 year (n=6)	F=16.513
	1-5 years(n=43)	p<0.001
	>5 years (n=17)	
Grading OA	I (n=12)	F=190.077
	II (n=46)	p<0.001
	III(n=8)	
BMI(in Kg/m <sup>2</sup> )	Normal weight (18.5-24.9) (n=20)	F=0.215
	Overweight (25.0-29.9) (n=33)	p=0.807
	Obese (≥30) (n=13)	

# The statistical analysis includes ANOVA (for age, educational status, and monthly income) and t-test (for gender) to assess whether there are significant differences in the mean WOMAC scores across the different categories of the variables.

The results show that there is a significant difference in the mean WOMAC scores across the different age groups ( $p=0.001$ ), with older patients reporting higher WOMAC scores. However, there was no significant difference in WOMAC scores based on gender or monthly income ( $p>0.05$ ). Educational status showed a  $p$ -value of 0.074, which is close to the conventional cutoff for statistical significance ( $p<0.05$ ), suggesting a possible trend towards significance, but this result did not reach statistical significance.

Age may be an important predictor of WOMAC scores in patients with OA knee, while other socio-demographic factors may not be significant predictors. The above table showed that there was a highly significant statistical difference between total WOMAC score and age of the patients as  $p=0.001$ . But there was no statistical difference between total WOMAC score and other socio-demographic status as  $p>0.05$ .

Patients with a shorter duration of OA knee (less than one year) had significantly lower WOMAC scores compared to patients with longer durations of OA knee (1-5 years). The difference in WOMAC scores across these groups was significant ( $F = 16.513$ ,  $p < 0.001$ ).

In terms of grading of OA knee, patients with more severe OA knee (grade III) had significantly higher WOMAC scores compared to patients with less severe OA knee (grade I: grade II:). The statistical analysis shows that the difference in WOMAC scores across these groups was highly significant ( $F = 190.077$ ,  $p < 0.001$ ).

There was no significant difference in WOMAC scores among patients in different BMI categories, as indicated by the F-test ( $F=0.215$ ,  $p=0.807$ ). This suggests that BMI may not be a significant factor in determining the severity of pain, stiffness, and physical function in patients with knee osteoarthritis.

**Table V**

*Distribution of patients by SF-36 scores and socio-demographic status of the patients with OA knee (n=66)*

Socio-demographic status		SF-36 score (Mean $\pm$ SD)	Statistics <sup>#</sup>
Age (in years)	40-49(n=23)	36.89 $\pm$ 15.84	$F=0.492$
	50-59 (n=24)	39.99 $\pm$ 17.07	$p=0.614$
	$\geq 60$ (n=19)	32.68 $\pm$ 14.00	
Gender	Male(n=27)	42.84 $\pm$ 16.19	$t=3.294$
	Female (n=39)	30.78 $\pm$ 13.44	$p=0.002$
Educational status	Illiterate (n=15)	28.93 $\pm$ 7.28	$F=9.749$
	Primary incomplete (n=11)	30.10 $\pm$ 10.22	$p<0.001$
	Primary completed (n=21)	31.00 $\pm$ 12.28	
Monthly income(in taka)	Secondary and above (n=19)	49.52 $\pm$ 18.36	
	<10,000 (n=15)	31.47 $\pm$ 13.15	$F=6.101$
	10,000-20,000 (n=39)	34.69 $\pm$ 14.16	$p=0.004$
BMI(in Kg/m <sup>2</sup> )	>20,000 (n=12)	50.13 $\pm$ 19.12	
	Normal weight (18.5-24.9) (n=20)	32.56 $\pm$ 10.83	$F=1.875$
	Overweight (25.0-29.9) (n=33)	34.79 $\pm$ 14.75	$p=0.162$
Obese ( $p=0.61430$ ) (n=13)		42.90 $\pm$ 22.19	
	Characteristics		
	Duration(in years)	<1 years (n=6)	45.49 $\pm$ 24.97
1-5 years (n=43)		35.42 $\pm$ 14.40	$p=0.241$
>5 years (n=17)		33.00 $\pm$ 14.72	
Grading of OA knee	I (n=12)	39.92 $\pm$ 19.15	$F=1.007$
	II (n=16)	35.65 $\pm$ 15.47	$p=0.371$
	III(n=8)	29.77 $\pm$ 9.98	

# ANOVA or F-test for comparing means across more than two groups and the t-test for comparing means between two groups. A  $p$ -value less than 0.05 is considered statistically significant.

From the table, we can see that gender and educational status have significant effects on SF-36 scores in patients with knee OA. Male patients have higher SF-36 scores than female patients, and patients with higher educational status have higher SF-36 scores than those with lower educational status. Monthly income also has a significant effect on SF-36 scores ( $F=6.101$ ,  $p=0.004$ ), with patients with higher income having higher SF-36 scores than those with lower income. However, age does not seem to have a significant effect on SF-36 scores ( $F=0.492$ ,  $p=0.614$ ).

there was no significant difference in SF-36 scores among the three BMI categories ( $F=1.875$ ,  $p=0.162$ ). This means that BMI did not have a significant impact on health-related quality of life in patients with OA knee.

### Discussion

Worldwide, osteoarthritis (OA) is estimated to be the fourth leading cause of disability (6). Because of its chronic, painful, and disabling character, OA tends to impact HRQOL (15) profoundly. Our study aimed to assess the quality of life of knee osteoarthritis patients using the Short Form Health Survey (SF-36) questionnaire and the Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index.

More than half of the patients (59.1%) were female in the current study. OA is more prevalent in women than men. Although women have a lower prevalence of OA than men before the age of 50, there is a marked increase in prevalence among women after 50<sup>2</sup>.

There is a strong association between obesity and OA<sup>18</sup>. The present study found that half of the patients (50.0%) were overweight, and 19.7% were obese. A consistent result was reported in another study where researchers found that 50.3% of patients were overweight<sup>9</sup>.

Most of the patients (69.7%) had OA knee grade II, and others had grade I (18.2%) and grade III (12.1%). There was no patient having grade IV OA knee. However, other studies reported many patients having grade IV (9, 16, 17). The dissimilarity of results regarding the grading of OA knee might be because the mean age of the

patients was less than in other studies. However, again, those studies were conducted among a large population, whereas the sample size of the present study was only 66.

Higher scores on the SF-36 scale indicate better quality of life. Among the eight domains, the mental health domain had the highest score, and the physical role had the lowest score. These results were consistent with other studies.<sup>8,16,18</sup> Role emotional domain was affected a bit as the mean score, the third lowest score. Although the emotional role domain was affected a bit, a relatively higher score in the mental component than that of the physical component showed that mental health was less affected by knee OA. This could be due to better-coping mechanisms and adaptation to this chronic disease. The study by Affleck et al.<sup>19</sup> reported that patients with knee OA used various coping mechanisms, resulting in less pain and better mood than patients with RA.

Furthermore, OA might be considered a normal ageing process. Hence it was readily accepted (19). However, the study of Alrushud et al.<sup>17</sup> reported that the mental health component was relatively low compared to the physical health component. This could be due to two reasons. Firstly, knee OA causes pain and disability, leading to depression and anxiety. Secondly, it may be referred to as poor adaptation to this chronic disease.

In the WOMAC scales, lower scores reflect better quality of life. The patients' WOMAC subscales showed the mean pain, stiffness, and physical function scores. Here the mean of total WOMAC was  $28.14 \pm 3.99$ . A cross-sectional study was conducted to evaluate the correlation between condition-specific and generic health status questionnaires for measuring health-related quality of life in patients with osteoarthritis (OA) of the knee, where it was shown that the mean pain, stiffness, and physical function score were  $7.04 \pm 4.43$ ,  $2.08 \pm 1.88$  and  $22.10 \pm 13.20$  respectively.<sup>18</sup> The lower scores of WOMAC subscales of the present study might be because there was no patient with grade IV, whereas other studies had a significant number of patients with grade IV.

Patients with a disease for more than five years had significantly lower quality of life than those with a disease for less than one year or 1-5 years. Again, patients having grade III OA knee had significantly lower quality of life than others ( $p < 0.001$ ). Patients with knee osteoarthritis tend to increase their physical limitations, pain, and functional restriction with disease progression. Thus, these individuals suffer from the progressively increased impact on their activities of daily living, which leads to losses in labour relations, leisure, social life, and sleeping quality, also leading to an essential decrease in their quality of life.

The current study found no statistical difference between the patients' total WOMAC score and BMI, which was consistent with another study<sup>18</sup>

Male patients had a significantly better quality of life than females ( $p = 0.002$ ). The study of Zakaria et al. (20) reported that female respondents with knee OA were found to have lower scores in most of the QOL dimensions. The study of Lapsley et al.<sup>21</sup> showed that being female and having joint stiffness were significant independent predictors of total patient expenditures related to OA.

In this study, educated patients had a significantly better quality of life than illiterate patients ( $p < 0.001$ ). The study of Kawano et al.<sup>16</sup> found a strong association between a low level of education and a low perception of quality of life. Educated people have better access to information about the prevention and treatment of OA than illiterate people. The study of Jhun et al.<sup>22</sup> found that a low educational level increases up to twice the chance of having osteoarthritis and, therefore, a low perceived quality of life. According to these authors, individuals with low education usually have manual occupational activities or repetitive physical labour, which might worsen their disease condition and, after that, their quality of life.

Patients having monthly income  $> 20,000$  takas had a significantly better quality of life than others ( $p = 0.004$ ). Alrushud et al.<sup>17</sup> also reported that income was significantly associated with quality of life ( $p = 0.007$ ). Furthermore, they

showed that patients with high incomes were able to hire special servants or use assistive aid, and this would affect their quality of life.

The current study found no statistical difference between the total SF-36 score and the BMI of the patients. However, another study found a strong association between the patients' total SF-36 score and BMI<sup>18</sup>. The dissimilarity might be because the present study was conducted among patients where 19.7% were obese, whereas another study was conducted among patients where 33.0% were obese.

The present study found no significant statistical difference between the total SF-36 score and the duration and grading of the OA knee of the patients. However, this might be because the SF-36 instrument is a generic rather than a disease-specific instrument.

## CONCLUSION

It can be concluded that patients with OA knee had relatively poor quality of life in physical health component than that of mental health component and role of physical domain was most affected among all domains. Female, illiterate patients with lower family income had more suffering with poor quality of life according to SF-36. Elderly patients with more advanced disease and prolonged disease duration had poor quality of life as measured with WOMAC.

## Limitations of the study

This study had several limitations.

- The research was conducted in a selective hospital (BSMMU) in Dhaka city, which limits the applicability of the findings to the patients all over Bangladesh.
- The patients were recruited by purposive sampling, which might lead to sampling bias.

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