

Impact of the Residential Landscape on Residents' QOL: A Study from the Perspective of Sustainable Development

Hung Ho-Mo (✉ hdj@g.pccu.edu.tw)
Chinese Culture University

Research Article

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Abstract

Good residential quality is not only conducive to living comfort but also adds value to the residence. Therefore, whether it is for self-occupation purposes or investment purposes, individuals will inevitably consider the quality of a residence when deciding on ownership. In addition, most residents also expect to improve their residential environment through beautiful landscapes and green spaces because it affects their quality of life (QOL). This study examined the impact of the residential landscape on the quality of residential environment and on residents' QOL in Taipei City. A structured questionnaire was developed to analyze participants' perceptions and attitudes regarding these associations. The results revealed that most residents had expectations and demands concerning the residential landscape and they perceived that the benefits of the residential landscape influenced their QOL and whether they purchased the residence. Residents valued the residential environment, including green spaces and gardens. The residential landscape has an important impact on the selection of a residential location, and it plays a key role in enhancing residents' QOL.

Introduction

Housing is needed to provide people with shelter from wind, rain, cold, and danger, and a sanctuary in which to be born, grow, and learn (Kothari et al. 2006; UN-HABITAT 2014). With transformations and improvements arising from socioeconomic developments, people's demands for housing have become more complex and diversified. They are no longer looking for a physical building alone; they also expect a residential environment of good quality. Concurrently, quality housing reflects a higher standard of living. Quality housing ensures a residence that will provide a place of refuge and rest, which contributes to individuals' health (World Health Organization 2018). In addition to housing quality, residents have expectations and needs regarding the quality of the surrounding environment and the management of the residential community.

Individuals have different priorities when purchasing a house and deciding on a residential location, depending on their characteristics (Han and Wang 1995) and financial capabilities. However, a common and important requirement is the quality of the residential environment—part of which is determined by the residential landscape. The quality of the landscape around a residence is reflected in the value of the land and housing price and has become one of the factors affecting the selection of and satisfaction with a residential location. The quality of a residential environment can reflect residents' psychological well-being (Manca et al. 2019), sense of fulfillment, and the degree to which their social (World Health Organization 2010) and basic needs are met. The quality of a living environment not only indicates happiness (Molinsky and Forsyth 2018) in the same way of gross domestic product and economic growth indicators, but also reflects the concern and satisfaction with one's quality of life (QOL). Residents expect a high-quality residential environment, and the benefits (or lack thereof) of a residential landscape are vital.

The purpose of this research was to study the impact of residential landscape on residents' QOL. A survey based on a structured questionnaire was conducted to analyze and understand residents' expectations and needs for their residential landscape, the importance of the residential landscape to them when selecting a residential location, and the factors affecting their QOL. The factors affecting residents' perception and attitudes of the benefits of residential landscape were also examined. This led to a deeper understanding of the way residential landscape affects residents' expectations of their residential environments. Through the findings of this research, we can better understand that emphasizing the residential landscape not only improves residents' QOL but also improves the quality of the urban landscape (Bonaiuto et al. 2015; Skalicky and Čerpes 2019). For example, a residential landscape full of flowers and trees adds beauty and greenery to an urban landscape.

Requirements for a Residential Environment and Factors Affecting its Selection

A residential environment includes all tangible and intangible factors related to residential living. It encompasses physical (the actual facilities) and non-physical (the various conditions or backgrounds) aspects. The horizontal spatial hierarchy of residential environments can be categorized into the following environments: indoor, housing, neighborhood and community, and urban and regional. Among these, the housing environment is slightly larger in scale than the indoor environment. The former includes the natural environment (such as sunshine, wind direction, and terrain/topography), housing orientation, public spaces, surrounding roads, treatment of ground surfaces, and public facilities (such as water, sewage and waste treatments, and energy supply [Hsieh and Huang 1998; Wu 1993]). A residential environment must be properly zoned based on spatial hierarchy to ensure sufficient supplies and quantities of basic facilities (Skalicky and Čerpes 2019). Furthermore, owing to improvements in the quality and quantity of the supply and demand of the residential environment, residents can feel comfortable, happy, safe, and hygienic (Keles 2012; Tsai and Hu 1994). Therefore, a well-planned residential environment that considers the layout and provision of rooms, the residential environment, and all the facilities can meet residents' needs and improve the quality of their residential environment (Skalicky and Čerpes 2019; Ye 2009), and enhance the beauty of the urban landscape (Scyphers and Lerman 2014).

Requirements for a residential environment vary depending on the specific characteristics of the residents. Nevertheless, there are various factors that generally affect selection of a residential environment. Tsai and Hsu (1994) proposed that five types of factors affect the selection of a residential environment: family, economic, social, internal housing environment, and external community environment. Their research used the weight of various factors affecting the residential environment to approach what factors were valued. The results indicated that the most important factors were health (including lighting, privacy, management, and external appearance of the building) and comprehensiveness of environmental facilities (including proper roads, venues for socialization in the neighborhood, level of greening, and size of the living area).

Yang and Chiang (1993) conducted a study from the perspective of maximizing consumer utility and found that the factors affecting the selection of a residential location included proximity to local public facilities, physical nature of the house itself, accessibility to transportation facilities, and the size of the house and its surroundings. Robinson (1979) proposed that the following factors affected housing prices: characteristics of the residential location, physical environmental attributes of the residential community, characteristics of the neighborhood, socioeconomic background of the community residents, residents' behaviors in housing selection, and spatial distribution of the residences. Su et al. (1977) conducted a large-scale investigation into the factors affecting land prices in Taipei and found that the main factors were: distance from the city center, nearest neighborhood commercial district, nearest park, nearest sewage treatment plant, and width of the road that the residence faces. Hsieh et al. (2000) noted that the land prices and real estate values of immovable properties in Hsinchu City increased with proximity to neighboring parks, thereby confirming an external environmental benefit of well-developed green parks. A green environment (e.g., a park) in a neighborhood was significantly associated with residents' health benefits, including self-rated health conditions (Tzoulas et al. 2007; Won and Lee 2020), mental health, stress levels (Gascon et al. 2015; Won and Lee 2020), and obesity (Ellaway et al. 2005; Won and Lee 2020). A few studies also found significant associations between perceived neighborhood environments (e.g., green space, a place to exercise, safety from crime, and street cleanliness) and social capital (Lee et al. 2018; Won and Lee 2020; Yoo and Lee 2016). Further, in the selection of residential locations, increased attention is being paid to the beauty and comfort of the surrounding residential landscape and how it enhances the quality of the residential environment. Therefore, this study explored some factors affecting residential and investigated the benefits of residential landscape on the quality of residential environments.

QOL and Residential Environments

Keles (2012) believed that environmental quality is one of the most important components of QOL. Aragonés et al. (2017) mentioned that residential satisfaction is an indicator of well-being and a subjective QOL; that is, those with good residential quality will have a good QOL. The quality of the residential environment is one of the key items in the pursuit of QOL (Kesalkheh and Dadashpoor 2012). The quality of a residential environment is determined by multiple components including nature, open space, infrastructures, the built environment, facilities of the physical environment, and natural reserves—each of which has unique characteristics and quality (Keles 2012). Based on van Poll's (1997) definition, residential environmental quality is a subjective value concept, which is determined by an individual's satisfaction with the house, neighborhood, and neighbors (Kesalkheh and Dadashpoor 2012). The scope of factors affecting the residential environment is extensive and complex; however, the most important consideration is the degree of habitability (Wu 1993). Chapin and Hightower (1965) indicated that a good residential environment should have well-appointed physical and non-physical conditions. Physical conditions may include the built environment, house appearance, interior decoration and equipment, public facilities, natural environment, and the landscape surrounding the house. Non-physical conditions may include harmonious neighbor relations, community services, economic development, residential life culture, and residential amenity. Further, they explored the factors related to a residential location, and

they found that individuals' satisfaction with basic life necessities and personal demands can be used to define the value-system relating to the quality of the residential environment (Chapin and Hightower 1965).

QOL relates to the well-being of people and the good quality of the residential environment (Keles 2012). It is a level of satisfaction or happiness based on the realization of subjective psychological desires, including personal values, goals, beliefs, and needs. Concerning residential environment, there are sufficient and universal public facilities and services to meet individuals' daily needs (Kelles 2012; Kesalkheh and Dadashpoor 2012; Wu 1993). In a study on Taichung residents' perceived quality of the residential environment, Sun (1994) found that residents of Taichung City paid the most attention to the residential environment and public security, and the least amount of attention to daily shopping places. The living environment was not only the most important but parks and open spaces, public security, and road safety around a residential environment were also important attributes that could enhance QOL.

The WHO and the American Public Health Association's Committee on Housing and Health proposed that a good residential environment should satisfy various requirements including safety, health, urban pollution prevention, convenience, and amenity (Han and Wang 1995; Krieger and Higgins 2002; Lian 1990; World Health Organization 2018). Thus, to improve the quality of the residential environment, in addition to achieving these good residential environment conditions, it is necessary to improve people's living standards and strengthen living awareness. Living awareness is residents' motivations, attitudes, needs, and expectations concerning the living environment. Residents who live in the same area develop a sense of psychological identification with the area because improving the quality of the residential environment requires residents to cooperate to maintain it (Chu and Lin 2007). Moreover, identifying ways to improve the quality of residential environments and enhance people's well-being have become the targets of joint efforts by individuals and social groups.

Residential Landscape and Landscape Perception

The residential landscape is the outdoor area surrounding a house that comprises gardens, yards, and green spaces. It is a place for residents to perform activities and communicate; however, it is also a key component of the urban landscape (Ye 2009). The residential landscape enhances the appearance of the residential environment (Cook et al. 2012). Marcus (1982) noted that a pleasing residential appearance is not associated with any particular housing style, but rather with variety in building height and facades, color, good landscaping, pleasant views from dwellings, a non-institutional appearance, and high levels of maintenance. The landscape and site layout contribute highly to resident satisfaction. The ideal situation for most families is to live in a house with a garden. Alternative or higher density forms of development should therefore offer as many of the benefits of house dwellings as possible (Marcus 1982). Lin (1999) stated that residential quality goes beyond the quality of the house itself, and includes issues related to the service level of public facilities and environmental quality, such as transportation routes, schools, parks, and markets near the house.

To ascertain the conditions being considered when making a housing purchase, Huang (1994) and Hung (1985) identified the following factors related to residential landscape: nearby parks and green spaces, beautification of balconies and the courtyard garden, a beautiful and scenic environment, public recreational facilities, and view of the surrounding landscape from within the home (Lin and Tseng 2000). An issue with the high population concentration and vast amount of land being gradually occupied by buildings and roads is that it leads to the reduction of green spaces and the desertification and deterioration of the urban landscape and environment. The demand for green spaces has thus become more intense for urban living and urban landscapes. The residential landscapes are primary settings of everyday interactions between humans and the environment (Bhatti and Church 2001; Cook et al. 2012). The residential landscape provides important amenities while contributing to both intended and unintended environmental consequences (Cook et al. 2012; Larson et al. 2009; Martin 2008). The residential landscapes examined in this study included all the leisure and recreational facilities around a residential environment and the areas that can be green spaces and beautified, a courtyard garden located in the space next to one's house and adjacent to other houses, and the parks and green spaces surrounding the residential area.

Residents' psychological responses (Milfont 2012) arising from the intertwining of their demands and expectations for their residential environment affect residential landscape factors and the environment. Many scholars have confirmed the existence of the impact of the environment on human perception, attitudes, and behaviors (Kaiser et al. 2007; McIntyre and Milfont 2016; Milfont and Duckitt 2010; Voski 2020). After the information and knowledge provided by the environment interact with individuals' attributes, perceptions, motivations, preferences, demands, expectations, and experiences (Aragonés et al. 2017; Cerina et al. 2017; Manca et al. 2019), different physiological and psychological reactions and processes are generated depending on the characteristics of the individual and the environment. The landscape perception process (Eiter 2010; Kaymaz 2012; van Heijgen 2013) is a psychological experience through which the cognitive observer can understand the physical scenery, spatial functions, and meaning of a place in the surrounding environment through feelings, perceptions, and thoughts toward factors such as the surrounding space, environment, and landscape. Hence, residents have expectations for, preferences for, and experience satisfaction with the residential environment through perception, motivations, attitudes, demands, and other psychological factors. Such an interactive relationship between residents and the residential environment corresponds to residents' awareness of that environment and their residential behaviors.

Materials And Methods

Aim and Method of the Investigation

This study examined the impact of residential landscape on residents' QOL, and the research method was a questionnaire survey. This was used to understand residents' expectations and requirements for their surrounding residential landscape based on their perceptions and attitudes, the importance of the residential landscape to their selection of residential location, and factors affecting the quality of the

residential environment (including the importance of the residential landscape and factors affecting positive expectations of the residential landscape).

A paper-and-pencil questionnaire administration was developed; the items were presented on paper and responses were analyzed to understand general residents' perceptions, attitudes, and expectations. The questionnaire was anonymous. The interviewees who answered the questionnaire were residents of Taipei City, and they were randomly sampled. Before they answered the questionnaire, participants were given a verbal explanation of the content and asked to give verbal consent for participation. Participants who refused to participate were excused. This research complies with the human-oriented research ethics guidelines to ensure that all research participants freely agree to participate in the research with sufficient information. A street intercept survey in some business districts of Taipei City, that is, station square, Zhongxiao commercial district, and Tianmu commercial district was also conducted.

Questionnaire Design

First, in designing the questionnaire, content validity was assessed. The preliminary assessment of the content of the questionnaire is to judge the completeness and appropriateness of the content of the questionnaire through experts. Three scholars in the field of landscape planning were invited to discuss the appropriateness of the questionnaire items and whether any should be revised. They assessed its readability, whether there were any mistakes, and item meaning. The formal questionnaire was administered at the selected survey sites.

The questionnaire comprised five items referring to different aspects of residents' perception, attitudes, and expectations. Items 1–4 were rated on a five-point Likert scale. Each of the five responses had a numerical value, which were used to measure the attitude or importance or satisfaction under investigation. The response format used was a five-point Likert scale, for example, (1) *strongly disagree*, (2) *somewhat disagree*, (3) *neither agree nor disagree*, (4) *agree*, and (5) *strongly agree*. The first item asked participants about their attitudes regarding the positive effects of residential landscape on the quality of the living environment. Items 2–4 asked about their attitudes regarding the consideration of residential landscape for their selection of a residential location, the level of satisfaction from their housing regarding residential landscape, and the importance of residential landscape in enhancing the quality of the living environment. The fifth item asked about participants' residential expectations—specifically, it asked what they would wish to buy for their homes if they could afford it. There were 10 factors regarding the expectations that they have of their future residential environment. The participant could mark however many they deemed important out of the 10 conditions. Lastly, the sixth item was that participants were asked to provide demographic information.

Results

Basic Data

SPSS statistical software (2009; version 18) was used to analyze the data obtained from the questionnaire survey. A total of 130 questionnaires were distributed during the survey. After eliminating three that were invalid, 127 valid questionnaires were analyzed. There were 49 (38.6%) male and 78 (61.4%) female participants. Most were between 20–40 years of age.

Analysis of Perception and Attitudes Concerning Residential Landscape

Table 1 shows the mean item response for participants' perception of the residential landscape when deciding on the location of their home. Most participants had a high level of perception (mean value above 4). Further, 90.5% answered "they will definitely" or "they will" consider the residential landscape when determining residential location; and 91.4% answered that they were "strongly satisfied" or "somewhat satisfied" with the residential landscape in their housing location. That is, participants whose residences had lovely courtyards and gardens, or were surrounded by a beautiful landscape and green spaces, were more satisfied with where they lived as compared to their counterparts. Most (84.3%) participants answered that the residential landscape was "strongly important" or "important" for improving QOL. Whether the residential location was surrounded by landscape and the association between residential landscape and QOL were perceived as important. In other words, residential landscape impacted residents' QOL and satisfaction with their housing, and it influenced their decisions concerning residential location.

Table 1
Perception of residential landscape.

| Item | Mean | SD |
|---|------|------|
| Consider RLE when determining residential location ^a | 4.24 | 0.70 |
| Satisfaction with the RLE in their housing location ^b | 4.22 | 0.71 |
| Importance of RLE for QOL ^c | 4.09 | 0.71 |
| RLE = residential landscape. ^a 5 = I will definitely, 4 = I will, 3 = not necessarily, 2 = I will not, 1 = I definitely will not. ^b 5 = strongly satisfied, 4 = somewhat satisfied, 3 = neither satisfied nor dissatisfied, 2 = somewhat dissatisfied, 1 = strongly dissatisfied. ^c 5 = strongly important, 4 = important, 3 = neither important or unimportant, 2 = somewhat unimportant, 1 = strongly unimportant. | | |

Table 2 shows the percentage of participants who would buy 10 different things for the residence if they could afford them. More than 60% of participants chose "convenient transportation," "lovely landscape with parks and green spaces," "excellent public security," "convenient shopping," "peacefulness and comfort," and "excellent environmental sanitation." The results indicated that the residential landscape is an important factor considered by homebuyers.

Table 2
Factors considered when selecting a residential environment.

| Factor | % of participants |
|--|-------------------|
| Convenient transportation | 89.0 |
| Lovely landscape with parks and green spaces | 75.6 |
| Excellent public security | 74.0 |
| Convenient shopping | 74.0 |
| Peacefulness and comfort | 67.7 |
| Excellent environmental sanitation | 66.1 |
| Open and comfortable vistas | 48.8 |
| Beautiful courtyard garden | 40.2 |
| Possibility of walking to school | 29.1 |
| Venues for cultivating good neighborly relations | 25.2 |
| Other | 4.7 |

Effects of Residential Landscape on QOL

A reliability analysis was conducted regarding the benefits that the residential landscape has on improving QOL to determine whether participants' opinions were consistent.

The results indicated high reliability (Cronbach's alpha = 0.90).

Table 3 shows that participants agreed that a beautiful residential landscape with greenery and parks surrounding their houses contributed to improving QOL, enhancing living standards, improving urban landscape, providing mental comfort and stress relief, providing pleasure from visual aesthetics, improved health, improved air quality, provided enjoyment owing to the sights and sounds of nature, and provided a peaceful and comfortable housing environment. However, increased opportunities for participating in community activities to cultivate good neighborly relationships was rated the least important by the participants.

Table 3
Participants' perspectives on the benefits of residential landscape.

| Effects | Mean | SD |
|---|------|------|
| Improves QOL | 4.37 | 0.69 |
| Enhances living standard | 4.24 | 0.72 |
| Improves urban landscape of the residential area | 4.39 | 0.69 |
| Provides mental comfort and stress relief | 4.29 | 0.79 |
| Participates in community activities to cultivate good neighborly relationships | 3.39 | 0.92 |
| Provides pleasure from visual aesthetics | 4.30 | 0.69 |
| Feels good and happy to be home | 3.95 | 0.86 |
| Improves health | 4.28 | 0.74 |
| Has fresher air quality and can enjoy the sights and sounds of nature | 4.14 | 0.83 |
| Provides a peaceful and comfortable housing environment | 4.09 | 0.88 |
| Note: ^a 5 = strongly agree, 4 = agree, 3 = neither agree nor disagree, 2 = somewhat disagree, and 1 = strongly disagree. | | |

A regression analysis (enter method) was performed to examine the level of impact that the residential landscape has on improving QOL, and to construct a multivariable linear regression model. The partial regression coefficients and related statistical test results are shown in Table 4.

Table 4
Regression analysis of the positive effects of residential landscape on improving QOL.

| Effects | Partial regression coefficient (B) | Standardized regression coefficient (Beta) | t |
|---|------------------------------------|--|------------------------------------|
| Enhances living standard | 0.347 | 0.364 | 4.519*** |
| Improves urban landscape of the residential area | 0.130 | 0.131 | 1.555 |
| Provides mental comfort and stress relief | 0.240 | 0.275 | 3.052** |
| Participates in community activities to cultivate good neighborly relations | -1.590E-02 | -0.021 | -0.299 |
| Provides pleasure from visual aesthetics | -9.066E-02 | -0.091 | -1.003 |
| Feels good and happy to be home | 2.535E-02 | 0.032 | 0.388 |
| Improves health | 0.165 | 0.177 | 2.086* |
| Has fresher air quality and can enjoy the sights and sounds of nature | 6.725E-02 | 0.081 | 1.021 |
| Provides a peaceful and comfortable housing environment | 3.626E-02 | 0.47 | 0.669 |
| Constant | 0.509 | — | 1.789 |
| R = 0.804 | R ² = 0.649 | Adj R ² = 0.619 | Std. error = 0.42 |
| Source of variation | Sum of squares | Sum of means squares | Degrees of freedom F |

Regression model: $Y = 0.364X_1 + 0.275X_2 + 0.165X_3$. Y: Improves QOL; X_1 : Enhances residential quality; X_2 : Provides mental comfort and stress relief; X_3 : Improves health. A significant B-weight indicates the Beta-weight and semi-partial correlation were significant. B represents unstandardized regression weights. Beta indicates the standardized regression weights. The t-value verified that the relationship between the individual independent variable X and the dependent variable Y was significantly correlated. F-value verified the significance of the regression relationship. * $p < .05$; ** $p < .01$; *** $p < .001$.

| Effects | Partial regression coefficient (B) | Standardized regression coefficient (Beta) | t | |
|------------------|------------------------------------|--|-----|-----------|
| Regression model | 38.494 | 4.277 | 9 | 23.702*** |
| Residual | 21.113 | 0.180 | 117 | |

Regression model: $Y = 0.364X_1 + 0.275X_2 + 0.165X_3$. Y: Improves QOL; X₁: Enhances residential quality; X₂: Provides mental comfort and stress relief; X₃: Improves health. A significant B-weight indicates the Beta-weight and semi-partial correlation were significant. B represents unstandardized regression weights. Beta indicates the standardized regression weights. The t-value verified that the relationship between the individual independent variable X and the dependent variable Y was significantly correlated. F-value verified the significance of the regression relationship. * $p < .05$; ** $p < .01$; *** $p < .001$.

The following factors had a significant impact on improved QOL: “enhances living standard,” “provides mental comfort and stress relief,” and “improves health.” Although the factors “improves urban landscape of the residential area,” “participates in community activities to cultivate good neighborly relations,” “provides pleasure from visual aesthetics,” “feels good and happy to be home,” “has fresher air quality and can enjoy the sights and sounds of nature,” and “provides a peaceful and comfortable housing environment” did not have a significant impact, they were nonetheless correlated with “improves QOL.”

The model indicated that the factor “improves the QOL” was affected by the following factors: “enhances living standard,” “provides mental comfort and stress relief,” and “improves health.” The proportion of explained variance for improved QOL was 64.9%.

Discussion

The results indicated that the residential landscape has an important impact on the selection of a residential environment location, and it plays an important role in enhancing residents’ QOL. The participants had expectations of a beautiful landscape and green spaces and a good quality residential environment.

There are many factors to consider when selecting the location of a residential environment. The physical aspects encompass the building of the residence, indoor environment, and outdoor landscape spaces while the non-physical aspects include ventilation, lighting, open vistas, management, safety, and security. This study investigated and analyzed the mandatory conditions for a good residential environment, and the results showed that more than half of the participants valued “convenient transportation,” “lovely landscape with parks and green spaces,” “excellent public security,” “convenient shopping,” “peacefulness and comfort,” and “excellent environmental sanitation” in the environment near their homes

In addition, the results showed those residents’ expectations of the residential landscape and its ability to improve their QOL affected their motives for selecting a residential location. This was because of the

positive correlation that existed between the feeling of satisfaction from the residential landscape and its importance in enhancing QOL. One's expectations of the residential landscape are reflected in the selection of and requirements for a residential location. In other words, when one chooses a residential location, expectations of the residential landscape and the need to improve QOL lead one to consider the residential landscape as the top priority.

Conclusion

Regarding residential landscape benefits, participants believed that an effective residential landscape could elevate their QOL; that is, they pay considerable attention to residential landscape. The following were deemed the most effective: "enhances living standard," "provides mental comfort and stress relief," and "improves health." These are the important functional attributes of the residential landscape that may enhance residents' QOL, well-being, and health. Residents want a good residential landscape and expect it to improve their QOL, thus indicating its importance. Although the ideal form of living may vary between different residents, most participants attached great importance to the residential landscape. The government and private sector can utilize these findings when planning and constructing residential projects. Specifically, landscape planners/designers and decision-makers can refer to these findings when developing marketing plans and tactics for existing real estate and residences, considering sites and locations for future residential developments, and designing the overall environment of their residential projects.

Declarations

Funding: This research received no external funding.

Conflicts of interest: The author declares no conflict of interest.

Availability of data and material: All data generated or analyzed during this study are included in this published article.

Code availability: Not applicable.

Authors' contributions: Substantial contributions to the conception and design of the work; and the acquisition, analysis, and interpretation of data for the work: HHM. Drafting the work and revising it critically for important intellectual content: HHM. Final approval of the version to be published: HHM. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: HHM

Ethics approval: The study was performed in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. However, the study was exempted from ethical approval as the research has the lowest risk and the possible risk to the research object does not exceed those who have not participated in the research.

Consent to participate: Not applicable.

Consent to publish: Not applicable.

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