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Case Report

Successful nutritional therapy at home for a patient with invasive breast carcinoma: A case report

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ABSTRACT

Breast cancer is one of the most prevalent types of neoplasm in the world, amounting to 2.3 million cases in 2020. Physiological and metabolic changes in the body of a cancer patient potentially cause malnutrition and cachexia due to reduced appetite and side effects of treatments. Meanwhile, malnutrition can be prevented and treated through adequate nutritional therapy in the hospital coupled with follow-up nutritional treatments at home. The case presents a 46-year-old woman with invasive right breast cancer, which was treated with a mastectomy and split-thickness skin graft. The patient had severe malnutrition and cancer cachexia due to loss of appetite and untreated cancer for 3 years. Nutritional therapy was given in the hospital alongside customized therapy at home during visits. Nutrition significantly improved after three home visits within three weeks as indicated by her daily intake, increased weight, muscle mass, and handgrip strength. Home visits were proven to be useful for the maintenance of the nutritional status of patients with invasive cancer. It also provided long-term sustainable nutritional solutions customized according to the income and living situations of the patient.

Introduction

Breast cancer is one of the most prevalent types of neoplasm in the world, amounting to 2.3 million cases in 2020.[1] The rise in the number of patients has been reported in Southeast Asia, in which 159,000 women were diagnosed in 2020.[1] Physiological and metabolic changes in the body of a cancer patient potentially cause malnutrition and cachexia due to reduced appetite and side effects of treatments.[2] Untreated malnutrition causes a reduction of immunological functions, muscle strength, response towards chemotherapy, and reduced quality of living.[3] Furthermore, malnutrition can be prevented and treated through adequate nutritional therapy at the hospital and follow-up nutritional treatments at home. Nutrition also plays a critical role in cancer patients by maintaining muscle mass, mediating inflammation and immunity, as well as attenuating anemia, and its antioxidative properties.[4,5]

However, nutrition therapy at home is not conducted routinely in Indonesia. Home visits enable long-term nutritional maintenance which could subsequently assist in post-operative wound healing, as well as increasing functional capacity and quality of life.[6] This case report portrays how a home care program offered by the Department of Nutrition at the University of Indonesia can assist in providing nutritional therapy to a patient with invasive ductal carcinoma to improve the quality of life.

Case presentation

Timeline

The case presents a 46-year-old woman who was diagnosed with invasive breast cancer. The patient had a history of an enlarged mass in the right breast which was first identified 3 years before admission. The mass appeared initially as a small, skin-colored, round mound, immobile, and did not cause pain or itching. Due to the pandemic, the patient did not seek medical attention, and the mass grew to the size of a soccer ball within 4 months. The skin then experienced discoloration and turned brown, became painful, and produced a discharge of blood and pus which gave out a pungent smell. The smell diminished the patient's appetite to where she was only consuming 700 kcals (23 kcal/kgBW) and 27 g protein (0.9 g/kgBW) per day, leading to 25 kg weight loss within 2 years.

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The reduction of food intake caused extreme lethargy in the patient, who was then admitted to the hospital. Physical examination showed stable vitals, and the presence of malnutrition such as sunken temples, as well as protruding knees and clavicles. The mass on the right breast was 30 cm in diameter, hard and painful on palpation, immobile, with seepage of blood and pus. Anthropometrical measurements were carried out using mid-arm circumference, giving the results of 30 kg, leading to a body mass index of 11 kg/m^2 which was interpreted as severe malnutrition. The examination also confirmed cancer cachexia due to the low body mass index (BMI), lethargy, anorexia, anemia (6.2 g/dL), and hypoalbuminemia (2.3 g/dL). Moreover, the patient was diagnosed with a significant risk of refeeding syndrome due to low BMI ($<$ 16 kg/m^2). At this time, the patient could only stay in bed due to lethargy and was subsequently scheduled to undergo a tumor debulking and simple mastectomy, followed by split-thickness skin grafting.

The patient stayed in the intensive care unit for 3 days after the operation and was fed through a nasogastric tube with good feeding tolerance. After 3 days, the patient was transferred to the medical ward already being able to consume food orally, reaching 58 kcal/kgBW and 2.5 g/kgBW protein per day. The diet consumed was in the form of porridge, oral nutritional supplements, and corn oil. The patient's feeding tolerance improved each day until the patient could consume 62 kcal/kgBW a day by the time of discharge. Micronutrients were administered for wound healing and metabolism in general including vitamin B complex 3 $\times$ 1 tablet, zinc 2 $\times$ 20 mg, and vitamin C 1 $\times$ 250 mg. The patient's condition improved every day and she admitted to having less pain and increased appetite each day. The administration of food was monitored strictly due to the risk of refeeding syndrome. However, no refeeding signs and symptoms were found. This implied that the provision of food could be increased every day without harm. At discharge, the patient was instructed to consume 2900 kcals (69 kcal/kgBW) and 86 g protein (2.8 g/kgBW) per day. The physician nutrition specialist also explained how further home care visits for nutritional therapy would be an opportunity to improve and prepare the body for planned chemotherapy.

Intervention and outcome

Because of a visit to a family in Central Java, the first visit with the patient took place 2.5 months following discharge. Due to lethargy and difficulty breathing, the patient was bedridden coupled with a complaint of nausea but she still managed to eat. Furthermore, the appetite level was very low brought about by overconsumption of water. A minimum of 3600 mL of water was consumed each day because of extreme thirst culminating in bloating and fullness. Foods such as chicken, beef, eggs, and tofu were also avoided due to a cultural belief that it may cause cancer. Overall, the food consumed included 1100 kcals (32 kcal/kgBW), 74 g protein (2.2 g/kgBW), 19% fat, and 53% of carbohydrates in the form of red rice porridge, white rice, steamed fish, 6 egg whites, 2 slices of tempeh, and 1 bowl of boiled vegetables. Disease-specific oral nutritional supplement (ONS) was also recommended up to 3 measuring spoons a day. However, the lethargy caused feelings of hopelessness and weakness to consume even more. Despite her lethargy, the patient still consumed more than the usual amount of food before surgery.

Physical examination results were the same as the first hospital assessment, but the patient had gained 4 kg thereby increasing the BMI to 15.1 kg/m^2. Body composition and handgrip strength measurements were taken, and the results are shown in Table 1. The patient was then educated on how to improve her nutrition such as the importance of protein in maintaining muscle mass and the immune system, how to cook protein sources properly (not charred or deep fried), eating small frequent meals to combat nausea, and sources of specific nutrition such as omega-3 to combat inflammation from cancer. Additionally, a food prescription detailing what to eat, the necessary portions and meal times were provided. The patient was also given multivitamins consisting of vitamin C 500 mg, vitamin B_1 50 mg, vitamin B_2 25 mg, vitamin B_6 10 mg, vitamin B_{12} 5 mcg, calcium 20 mg, vitamin B_3 50 mg, zinc 20 mg, vitamin B_1 1 $\times$ 100 mg, and vitamin D 2 $\times$ 1000 UI. The targets for the next home visit were to: consume 1400 kcals (41 kcal/kgBW) and 81 g protein (2.4 g/kgBW) per day, drink only 1800 mL a day, engage in light physical activities such as short strolls, and to sunbathe 10–15 min a day at 11 am to 1 pm.

Table 1
Anthropometry, body composition, and functional capacity measurements.

	First visit	Second visit	Third visit
Body weight (kg)	34.0	36.0	36.4
BMI (kg/m^2)	15.1	16.0	16.2
Visceral fat (g)	0.5	0.5	0.5
Fat mass (%)	18.4	12.2	17.9
Muscle mass (%)	27.9	30.6	28.3
FFMI (kg/m^2)	12.9	13.6	11.6
Handgrip strength	Right: 2.0 kg Left: 1.3 kg	Right: 2.7 kg Left: 1.8 kg	Right: 5.7 kg Left: 3.4 kg
Functional capacity	Non - Ambulatory ECOG score 3	Ambulatory ECOG score 1	Ambulatory ECOG score 1
Anthropometry	BW 34.0 kg, BMI 15.1 kg/m^2	BW 36.0 kg, BMI 16.0 kg/m^2	BW 36.4 kg, BMI 16.2 kg/m^2
Intake analysis (per day)	Energy 1100 kcal (32 kcal/kgBW), protein 74 g (2.2 g/kgBW)	Energy 1815 kcal (50 kcal/kgBW), protein 96 g (2.7 g/kgBW)	Energy 1700 kcal (47 kcal/kgBW), protein 96 g (2.6 g/kgBW)
Diet prescription (per day)	Energy 1300 kcal (38 kcal/kgBW), protein 76 g (2.2 g/kgBW)	Energy 1950 kcal (54 kcal/kg BW), protein 91 g (2.5 g/kgBW)	Energy 1950 kcal (54 kcal/kgBW), protein 91 g (2.5 g/kgBW)

BMI, body mass index; FFMI, fat free mass index; g, gram; kg, kilogram; kcal, kilocalories; kgBW, kilogram body weight; BW, body weight; ECOG, Eastern Cooperative Oncology Group.

The second home visit was carried out one week later, in which the patient was observed to be more lively and energetic in doing housework and taking short strolls around the house. The patient also admitted to having more appetite, no nausea, and could sleep better. Moreover, the amount of food consumed per day increased compared to the first visit, amounting to 1800 kcals (50 kcal/kgBW), protein 96 g (2.7 g/kgBW), fat 19%, and carbohydrates 60% in the form of rice, boiled fish or chicken, vegetables, tempeh, egg whites, potatoes, and disease-specific ONS amounting to 10 spoons a day. The patient also had reduced water intake, amounting to 2400 mL a day. The body composition and handgrip measurements were found to have improved, as shown in Table 1. The patient did not undergo chemotherapy, and given the excellent progress observed, the food prescription was upgraded consisting of 1950 kcals (54 kcal/kgBW), 91 g of protein (2.5 g/kgBW), 26% fat and 55% carbohydrates in 3 main meals as well as 3 snacks per day. The patient was still hesitant in using cooking oil but was reassured that oil use was acceptable in proper amounts of 3 teaspoons for sautéing. It was also recommended that the patient continue the multivitamins for the next week.

The third home visit was carried out a week later, in which the patient was observed to be weaker than the previous visit due to the first chemotherapy four days prior. There were complaints of nausea and vomiting post-chemotherapy which hindered food consumption and enable the patient to only consume 20 dates in a day despite taking antiemetics. This caused a feeling of weakness and lethargy toward doing housework. The patient began eating again a day before the third visit, with the meal consisting mainly of rice, chicken or fish, and ONS. However, improvement was still observed in the anthropometric, body composition, and handgrip measurements as shown in Table 1. Considering the current condition, the patient was then given a food prescription amounting to 2000 kcal (54 kcal/kgBW), 91g protein (2.5 g/kgBW),

26% fat, 55% carbohydrates per day, and was instructed to take the same multivitamins (Fig. 1 and 2).

Overall, the condition of the patient improved significantly in terms of body composition, functional capacity, anthropometry, and food intake as shown in Tables 1 and 2, and 3. After the third home visit, concurrent follow-ups were made by phone and it was found that the patient was consistently eating well, reaching the recommended amount set by the food prescription. The anthropometrics were yet to be taken, but the patient had undergone three rounds of chemotherapy without significant side effects. Graphs B.1. and B.2. show the amounts of energy and protein consumed within three home visits. The clinical conditions of the patient during the home visits are summarized in Table 2.

Discussion

This study presents a classic manifestation of advanced cancer, evidenced by the cancer stage, severe malnutrition, and cachexia. Malnutrition was caused by self-restriction of food and by cancer which reduced appetite and hyper-metabolism. Furthermore, the family of the patient also believed in local proposed myths that certain foods cause cancer, such as beef, chicken, eggs, fish, and even tofu. These foods were not often present on the dining table, which further reduced the patient's caloric intake and contributed to the beginning of her muscle wasting. Home visits were conducted to make sure that the nutritional needs were fulfilled despite ongoing hypercatabolism from advanced cancer. These visits took into consideration the environment, financial conditions, and living conditions to adapt to the nutritional needs of the patient including food sources of macro and micronutrients.

Home visits revealed that the patient lived in the outskirts of West Java, where markets do not provide a wide variety of food. Additionally, the economic status was determined by the family's income per month, as well as the size and condition of the house. The patient lived in a small house made of wood planks, consisting of 2 rooms to accommodate 7 people, one bathroom which also served as a laundry room and a kitchen. The husband and the eldest son had a combined total monthly earning of 5 million rupiahs which was enough to feed 7 people and cover the medical

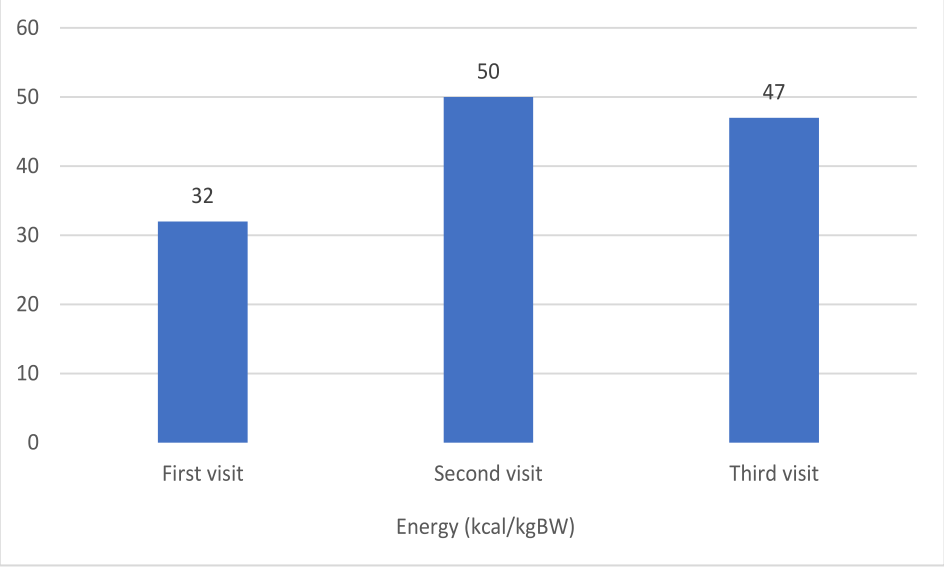

Fig. 1. Patient's energy consumption within three home visits
kcal, kilocalories; kgBW, kilogram body weight.

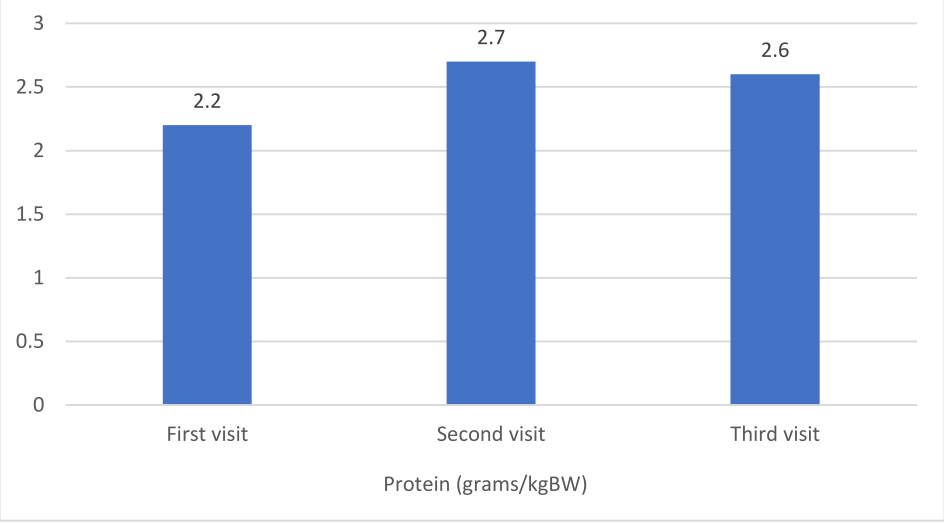

Fig. 2. Patient's protein consumption within three home visits
kgBW, kilogram body weight.

Table 2
Resume of patient's improvement.

	First visit	Second visit	Third visit
Clinical condition	The patient felt nauseous and had difficulty breathing. Pain in post-operative wound VAS 3. The patient felt weak and is bedridden.	Lively, energetic, and can already do housework and is sunbathing routinely. Post-operative wound pain VAS 1.	Felt nauseous and had decreased appetite for 2 days post-chemotherapy, afterward, the patient can eat as usual. Post-operative wound pain VAS 1.
Psyche	Felt sad and hopeless.	Seemed hopeful and happier.	The patient is a little discouraged due to chemotherapy side effects, but still determined to eat well.
Physical Assessment	Fully conscious Stable vitals	Fully conscious Stable vitals	Fully conscious Stable vitals
Feeding tolerance	Nauseous, decreased appetite, extreme thirst.	Increased appetite, but no more nausea.	Decreased appetite post-chemotherapy, but slowly getting better.

VAS, Visual Analog Scale.

insurance of the patient. This information helped ensure that the recommended food needs would not cause financial difficulties for the family.

The target for the diet prescription was adjusted according to the cancer nutrition requirements stated in the *European Society for Clinical Nutrition and Metabolism* (ESPEN) guidelines,[5] in which intake of energy was aimed at 25–30 kcal/kgBW/day and protein at 1.2–1.5 g/kgBW/day. Fat intake was recommended to be at 25%–30% of total calories, while carbohydrates ranged from 55%–60%. The energy output was 2200 kcal per day, calculated using the Harris–Benedict equation with the stress factor of 2.0 considering that the patient was severely malnourished. However, calories were given in increments due to the significant risk of refeeding syndrome. This is a deadly condition where the body undergoes depletion of electrolytes including potassium, phosphorus, and/or magnesium levels by more than 10% within 5 days of reinitiating or substantially increasing energy provision.

The patient was unable to reach the energy target during hospitalization due to her poor appetite but was able to reach the target for protein (2.3–2.7 g/kgBW), fat (25%–30%), and carbohydrates (55%–58%) after surgery. This intake was better compared to the first home visit since food at home was cooked without oil. The patient believed that ingesting oil may worsen her condition. Fortunately, the family was cooperative with any new information regarding food intake and preparation. Therefore, home visits were used wisely to educate the patient on how to reach the target energy, protein, and other macronutrients as well as their benefits. Since the patient could not eat much, ONS were recommended to help increase the calorie intake per day. Fortunately, the extended family in central Java provided the ONS since they were expensive.

Protein is one macronutrient that was emphasized to the patient, as proteolysis increases in cancer due to a rise in stress hormones and mediators of inflammation.[7] Insufficient protein intake potentially leads to severe muscle wasting and inadequacy of the immune system. Nevertheless, adequate intake of protein in cancer patients can still stimulate protein synthesis.[8] Leucine is an amino acid especially needed by patients with cancer due to its role in protein synthesis.[9] According to Prado et al.,[10] the consumption of β-Hydroxy-β-Methylbutyrate (HMB), a leucine metabolite, 3 g/day can serve as an anti-catabolic agent for cancer patients. The patient consumed leucine mostly from disease-specific ONS, amounting to 5g of leucine a day. It was also obtained from chicken, egg whites, and tofu which the patient eventually consumed after being educated on the benefits of protein. Effects of leucine were demonstrated through an increase in handgrip strength and muscle mass as shown in Table 1.

The type of fats recommended for consumption is unsaturated fats, namely omega-3.[11] The European Society for Clinical Nutrition and Metabolism (ESPEN) has recommended the administration of omega-3 or fish oil to cancer patients with severe malnutrition. Omega-3 has a therapeutic effect on malignancies, as it can inhibit tumor proliferation and induce anti-inflammatory properties. The recommended dose for EPA is 1.5 g/day[12] and the sources include ONS, fish oil supplements, and boiled fish 3 times a day, amounting to 2.3 g/day. The effect observed in the patient was in the form of improved appetite, which in turn increased body weight, as shown in Table 2.

The patient took multivitamins at home which provided micronutrients needed for wound healing, aiding metabolism, and preventing refeeding syndrome.[13] However, since multivitamins are expensive, the patient was taught that micronutrients can also be obtained through food sources, such as tomato, oranges, broccoli, guava, bell peppers, chicken breast, mushroom, spinach, eggs, as well as beef. These foods are sources of vitamin C, vitamin B complex, and zinc. They are all available in the local market and can be integrated into the daily meals of the patient.

Laboratory results during hospitalization showed that the patient had anemia with hemoglobin levels reaching 10.2 g/dL due to malnutrition and cancer. According to previous reports, cancer increases hepcidin production, which inhibits iron absorption thereby interfering with erythropoiesis.[14] The patient was given blood transfusions and iron tablets containing 20 mg elemental iron. As part of the home visit, the patient was educated on how to fulfill iron needs through food sources, such as spinach, mushroom, chicken liver, tempeh, and mackerel. The inflammation itself could be minimized by omega-3, zinc, and vitamin D.

Vitamin D plays a role in cancer patients, as it has anti-inflammatory properties in inhibiting *cyclooxygenase-2* (COX-2) and prostaglandin receptor expressions. It also stimulates apoptosis of cancer cells, prevents their proliferation, and modulates angiogenesis. Therefore, its administration can reduce catabolism, increase appetite, and prevent further metastasis of cancer.[15] The patient obtained vitamin D through supplements of 2000 IU a day, sunbathing 10–15 min a day, ONS, and consumption of boiled fish. Other local food sources of vitamin D include eggs, mackerel, sardines, and tilapia.

Physical activity was also one of the guided interventions given during home visits since it can support aerobic capacity, muscle strength, quality of life, confidence, and decrease fatigue. Misiag et al.[16] revealed that the best physical activity for cancer patients is a combination of aerobic and resistance exercises since they are associated with superior upper and lower body muscle endurance in breast cancer patients. The patient was too weak to move during the first home visit but some physical activity was still encouraged. After consuming the prescribed amount of calories, the patient began walking around the house and doing chores such as cleaning, doing laundry, cooking, and sweeping, which served as daily resistance exercises. The effects of physical activity were demonstrated through increased muscle mass and handgrip strength (Table 1).

The home visits had a good impact on the psychological state of the patient. During hospitalization, the patient seemed hopeless and on the verge of giving up in terms of feeding and surviving. This condition did not improve during the first home visit where the patient was still bedridden and barely had any appetite. However, the patient was enthusiastic about the idea of home visits, as they provided an opportunity to ask questions and get explanations that were not elucidated in the hospital. This culminated in high hopes and increased motivation to live longer for her husband and five children. The patient was more cheerful and enthusiastic during the second home visit, with improved energy due to all the food and ONS consumed. Physical improvement seen and felt by the patient brought about calmness and optimism that all the feeding interventions have the potential to bring change. During the

third home visit, the patient continued to be optimistic but seemed weaker due to chemotherapy side effects. Long-term nutrition therapy is not commonly carried out in Indonesia, hence, this report is one of the few successful cases where a patient was followed up at home. There were certain limitations as well, such as the difficulty to give the patient comprehensive treatment at home since other important medical fields were not involved. Additionally, the institution only scheduled 3 home visits. More visits could yield further benefits, specifically given that the patient was undergoing chemotherapy.

Overall, the home visits were greatly appreciated, and received great feedback from the patient and her family. They were grateful for the guidance on feeding and gained knowledge on the benefits of nutrients as well as physical activity. There was also a clear understanding of how dietary habits can influence the patient's quality of life. To date, the patient is still provided with ONS by the extended family in Central Java but she was also informed of food alternatives to ONS. Difficulties faced in this program consisted of having to confront the patient's strongly held beliefs of restrictive eating, and not being able to carry out routine laboratory checks to observe changes in the blood. Based on the results, home visits are recommended for more thorough and personalized dietary prescriptions, as well as for guiding patients on any personal issues including psychological or financial difficulties.

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CRediT author statement

Gabriella Nurahmani Putri: Writing – Original Draft, Writing – Review and Editing, Investigation, Conceptualization, Project administration**. Nurul Ratna Mutu Manikam:** Visualization, Supervision, Validation. **Diyah Eka Andayani:** Supervision, Visualization. **Trismiyanti:** Supervision. **Lukman Halim:** Supervision. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interests

The authors declare no conflict of interest.

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Ethics statement

The patient has given her written informed consent for this case report to be published. The patient understands that her name and initial will not be published and due efforts will be made to conceal their identity.

Disclosure

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Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declaration of Generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

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