Journal Pre-proof

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PII: S0890-5096(23)00755-0

DOI: https://doi.org/10.1016/j.avsg.2023.09.096

Reference: AVSG 6953

To appear in: *Annals of Vascular Surgery*

Received Date: 28 July 2023

Revised Date: 26 September 2023

Accepted Date: 27 September 2023

Please cite this article as: Kolen AM, Jager-Wittenaar H, de Vries JPPM, Dijkstra ML, Dijkstra PU, Dekker R, Krops LA, Geertzen JHB, Perceptions, experiences, barriers and facilitators regarding nutritional intake of patients with chronic limb threatening ischemia: a qualitative study., *Annals of Vascular Surgery* (2023), doi: https://doi.org/10.1016/j.avsg.2023.09.096.

Perceptions, experiences, barriers and facilitators regarding nutritional intake of patients with chronic limb threatening ischemia: a qualitative study.

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24 Short title: Nutrition and chronic limb threatening ischemia.

Abstract

Objective: Patients with chronic limb threatening ischemia (CLTI) are at high risk for amputation and other cardiovascular adverse events. Nutrition-related symptoms and malnutrition are common in the CLTI population, and lead to worse clinical outcomes. Understanding of the factors influencing nutritional intake is required to determine whether optimization of nutritional intake in this population requires interventions. Therefore, this study aimed to describe perceptions and experiences on nutrition of patients with CLTI, and to identify perceived barriers and facilitators influencing their nutritional intake.

Methods: In this phenomenological qualitative study, individual semi-structured, face-to-face interviews were conducted with patients with CLTI who lived independently. Interviews were transcribed verbatim, and reflexive thematic analysis was performed.

Results: Twelve participants were interviewed. Five themes were generated: (1) lack of nutritional risk perception, (2) role of nutrition for health, functioning and surviving, (3) multiple factors influencing nutritional intake, (4) limited nutritional advice, and (5) no intention to change current nutritional intake.

Conclusion: Patients with CLTI perceive nutritional intake as a necessity to survive and function. Patients express limited risk perception regarding adequate nutritional intake and undernutrition. Nutritional intake is mainly based on non-health related factors, as habits and taste, and multiple barriers hinder nutritional intake. Patients received no or only limited nutritional advice. Together this leads to an expressed lack of intention to change nutritional intake. Findings of this study stress the urgency for patient-centered nutritional support, to increase nutrition-related knowledge

and motivation, to prevent or treat undernutrition, and may improve clinical outcomes in patients with CLTI.

Key words: nutrition, malnutrition, qualitative, perceptions, chronic limb threatening ischemia.

Introduction

In the past decade, the importance of adequate nutritional intake and adequate nutritional status to improve clinical outcomes before and after major surgery became more evident. Adequate nutritional intake and status are key topics in the Enhanced Recovery After Surgery (ERAS) protocol.[1] The ERAS protocol is highly relevant for patients with chronic limb threatening ischemia (CLTI), due to the severity and poor prognosis of this condition, with mortality rates up to 30% at 1 year and 50% at 5 years following diagnosis.[2]

However, nutritional intake and nutritional status are not yet extensively studied in patients with CLTI. The few studies available reported high prevalence of malnutrition, including under- and overnutrition.[3-7] Although most patients with CLTI are overweight or obese,[8] undernutrition is of concern in this population, as undernutrition and overweight/obesity can coexist. Undernutrition is characterized by loss of weight and muscle mass, and caused by inadequate protein and/or energy intake due to disease or its treatment.[9] Inadequate protein intake negatively impacts wound healing, as amino acids are required for the healing process. Inadequate protein intake results in muscle mass breakdown, to provide amino acids for healing.[10, 11] Undernutrition increases risk of amputation and mortality in CLTI population.[6, 12-14]

To the best of our knowledge, risk factors for undernutrition specific for the CLTI population are not yet studied. Moreover, it is unclear how CLTI patients perceive their nutritional intake. Generally, in patients planned for (endo)vascular surgery, lack of appetite, nausea, fatigue, and pain are known to hinder nutritional intake.[15, 16] In patients in general practice, other factors, such as early satiety, eating alone, and polypharmacy are also known to hinder nutritional intake.[17] These symptoms are often present, and may also hinder nutritional intake in patients with CLTI.

To improve clinical outcomes in patients with CLTI, it is essential to prevent and treat malnutrition. Therefore, insight is needed into perceptions and experiences regarding nutritional intake. This insight will assist professionals in empowering patients who face nutritional challenges to improve nutritional intake. Therefore, this study aimed to describe perceptions and experiences of patients with CLTI regarding nutrition and to identify perceived barriers and facilitators regarding nutritional intake.

Methods

To describe the lived experiences of patients with CLTI regarding their nutritional intake, a qualitative study with a phenomenological methodology was chosen, in which reflexive thematic analysis was selected, as this analysis is suitable to find patterns in data while allowing conceptually informed interpretation of meaning.[18, 19] The study was not subject to the Medical Research Involving Human Subjects Act, and approved by the Central ethics committee of the University Medical Center Groningen (UMCG, METc: 2022/074). The study was reported following the Standards for Reporting Qualitative Research (SRQR, Appendix A).[20]

Participants

Participants were recruited during outpatient visits at two hospitals in the Northern Netherlands: UMCG (academic) and Ommelander Ziekenhuis Groningen (non-academic). Purposive sampling was followed, aiming for a variety in age, sex, living situation, education level, and comorbidities, to identify a variety of experiences and perceptions, which will result in rich and meaningful data. Included were patients with CLTI Rutherford 4-6, who lived independently, were 18 years or older, and could understand and speak Dutch.

Patients meeting the inclusion criteria were informed by their vascular surgeon. If patients were interested, the researcher (AK) informed the potential participant on the nature and purpose of the study and answered their questions. Patients received an information letter of the study and gave written informed consent before voluntarily participating in the study. The study was performed according to the Declaration of Helsinki.

Study design and data collection

Individual semi-structured, face-to-face interviews were conducted between May 2022 and February 2023. This study followed a constructivist paradigm, assuming that reality is a subjective experience (relativism), and that knowledge is created through transactions between the researcher and the participant (subjectivism).[21, 22] The interview guide (Appendix B) was based on the I-Change Model,[23] previous research[24, 25] and clinical expertise (dietetics: AK, HJ; vascular surgeons: JPdV, MD; rehabilitation physicians: RD, JG), and was pilot tested in healthy volunteers.

Interviews were conducted by the first author (AK), trained in Dietetics and Human Movement Sciences (MSc, female). The interviewer had no treatment relationship with the participants, and followed interview training. The first and third interview were discussed with two co-authors (PD, HJ), to evaluate the interview guide. These interviews were included in data analysis. Data collection continued guided by information power, considering study aim, sample specificity, established theory, quality of dialogue and analysis strategy.[26, 27]

Interviews were conducted at the participants' home, to provide a comfortable setting. Close relatives of the participant were permitted to attend the interview. Relatives were instructed that the participant was the focus of the interview, but they were welcome to provide additional

information. Before the interview, informal questions were asked to establish a relationship, and the researcher explained the interview process. Interviews were audio recorded. Field notes were taken by the researcher during the interviews. Transcripts were returned to the participants for member checking, on which no comments were provided.

Participants' characteristics were obtained by a questionnaire including: sex, age, weight, height (to calculate body mass index following WHO classification), living situation, employment status, highest education obtained, comorbidities, smoking status, pain level, and use of analgesics. Risk of undernutrition was assessed by the Patient-Generated Subjective Global Assessment Short Form (PG-SGA SF) questionnaire, that includes four boxes: weight, food intake, symptoms, and activity and function.[28, 29] Physical activity level was assessed by the Physical Activity Scale for People with a Disability (PASIPD) questionnaire.[30, 31] Data were stored and analyzed pseudonymized.

Data analysis

The interviews were transcribed verbatim (AK, EK), and field notes, e.g., nonverbal expressions, were included in the transcripts (AK). Only data expressed by the participant was included for data analysis, except when the participant agreed with what the relative said. Data were analyzed by reflexive thematic analysis following the six steps described previously.[18, 19] AK read and reread the transcripts to familiarize with the data, and took preliminary notes of initial trends. An experiential orientation to data interpretation was taken to emphasize meaning and meaningfulness as ascribed by participants. All relevant data regarding the research question was coded by a combination of latent and semantic coding, following a predominantly inductive approach. The first three interviews were double coded independently (AK, SR), to check whether this would have led to the development of a richer and more intricate interpretation of

the data. After discussing the first three interviews, AK continued the coding process, and developed core categories from the codes (sub-themes). Themes were defined as patterns of shared meaning underpinned by a central organizing concept.[18] Themes were generated, grouped, and reviewed (AK, LK), and discussed with the whole research team. A thematic map was produced (AK, LK) to aid the generation of collates codes to themes, and relation between themes (Appendix C). Themes were defined and named by the whole research team. ATLAS.ti software was used (ATLAS.ti version 22.2.4.0 Scientific Software GmbH, Berlin, Germany). Themes, quotations, and the interview guide were translated to English for publication (AK) and checked by the research team.

Trustworthiness

To enhance credibility, data analysis was an interrelated process of collecting and analyzing data, strengthening the interview process. The whole research team participated in peer debriefing to discuss preliminary findings and the focus of the subsequent interviews. Interviewing strategies were used to establish a good rapport between the interviewer and participant, e.g., by implying that there were no wrong answers to the questions, conducting the interview at a location the participant selected, and by underlining the interviewer's independence. Furthermore, mainly open questions were asked, to provide opportunity for the participant to answer in any direction. Member checking on individual transcripts was conducted. Transferability of the results was increased by a detailed description of the patient characteristics, and including patients from a university and non-university hospital. Dependability of results was addressed by a detailed description of data collection and analysis. Data were independently analyzed by two researchers, and findings were discussed with the entire study team (investigator triangulation), increasing the confirmability of the findings.

Results

Fifteen potential participants were contacted, of whom 12 were interviewed. Reasons for not participating were: poor health condition (n=2) and no reason specified (n=1). Six participants were recruited from the UMCG and six participants were recruited from the Ommelander Ziekenhuis Groningen. Age ranged from 56 to 86 years, and six participants were male. Ten participants lived with their partner, one also with two children, and two participants lived alone. Most participants had three or more of the following comorbidities: diabetes, hypertension, heart disease, pulmonary disease, renal disease, polyneuropathy, vasculitis, arthrosis, fibromyalgia, tinnitus, polymyalgia rheumatica, and cluster headache. All participants had Rutherford 5 or 6. Some participants used analgesics, i.e., paracetamol, oxycodone and/or tramadol. None of the participants was currently working. Most participants had low educational level, high risk of undernutrition, and low physical activity level (Table 1). Mean duration of the interviews was 58 ± 13 min. Eight interviews were conducted with the partner present, and in one a daughter was also present.

Five overarching themes were generated from the data: (1) lack of nutritional risk perception, (2) role of nutrition for health, functioning and surviving, (3) multiple factors influencing nutritional intake, (4) limited nutritional advice, and (5) limited intention to change current nutritional intake. Themes and axial codes are presented in Table 2 and described further below.

1) Lack of nutritional risk perception

Participants reported weight loss, which was mostly unintentional. Participants reported to eat the same as they were used to or what they considered sufficient, whereby participants indicated to not know the cause of their weight loss. Other causes of weight loss indicated by participants

included sickness and side effects of medication, i.e., nausea, diarrhea. Moreover, older age, higher nutritional requirements during disease, psychologic stress, and actively deciding to eat less snacks were mentioned to cause weight loss.

Participants perceived the weight loss mostly as positive, and did not relate unintentional weight loss to health risks. Participants considered themselves to have a high weight or wanted to lose more weight. The perception regarding weight gain was mostly negative, as participants assumed that higher weight negatively affects appearance, joints, mobility, and health. Some perceived weight loss and weight gain as negative, because of the need to buy new clothes.

> *I did not mind [losing weight] at all because I have plenty of kilos [...]. I just accepted it as it came (P11).*

Other participants perceived weight loss as negative, being a risk factor for health, or they disliked their appearance, and actively tried to restore (part of the) lost weight. Conscious actions to increase weight included eating the same as they used to or more, or using energy- and protein-enriched oral nutritional supplements.

> *I eat a sandwich with a fried egg in the evening. I do not like it, but I always try to eat it. I need to gain weight (P8).*

Intention regarding weight change varied between participants. Participants expressed to not actively decide to change their weight, indicating a passive approach regarding further weight loss. Other participants reported the intention to further lose weight. Participants indicated not wanting to gain weight.

Furthermore, participants reported loss of muscle mass and/or strength. Participants took no action to stop losing or increase muscle mass and/or strength. Participants related physical

activity or exercise, but not nutrition to muscle mass and strength. Due to pain and exertion related to CLTI, participants perceived increasing their physical activity or performing exercise as not physically possible.

2) Role of nutrition for health, functioning and surviving

Participants perceived eating as a necessity to survive, for daily functioning, and to satisfy feelings of hunger. Furthermore, participants experienced eating as enjoyable experience, while other participants experienced eating as a struggle rather than pleasant experience, and reported the necessity to stay alive as only reason for eating.

I must eat just to stay alive (P8).

Participants expressed limited knowledge about the role of nutrition in health and disease. Participants assumed that nutrition had no influence on vascular disease, wound healing, or survival. Other participants responded with a general answer, e.g., (healthy) nutrition is good for you, or expressed that nutrition could not influence their health as they were feeling good already.

I have some pain in my blood vessels. Nutritional intake is unrelated to that (P10).

Other participants reported a positive association between nutrition and health and disease, including effects on the vascular system and wound healing. For instance, participants indicated that nutritional intake is important for diabetes and therefore affects wound healing, that protein has a positive effect on wound healing, and that nutritional intake positively affects rehabilitation outcomes .

3) Multiple factors influencing nutritional intake

Participants indicated that their nutritional behavior, including product choices and amount of food, depended on varying factors, including healthy eating, taste, habits, physical condition, financial position, age, and social environment.

Participants reported to not consciously eat healthy, because of lack of knowledge or interest regarding healthy eating, or they experienced healthy eating as hard and less tasty.

As long as some food is served, I am fine with it (P2).

Participants who consciously choose to eat healthy reported this as important and influencing their health.

Participants indicated basing their diet choices on non-health-related factors, of which taste was one of the main factors. Some participants only ate what tasted well. Quitting smoking and reducing alcohol consumption improved taste.

I still cook what I like, and I eat what I like. I know I am a very boring person, but I am not interested in that [healthy eating] (P8).

Participants also expressed that their nutritional behavior was based on daily routine influenced by life-long habits. Participants reported many physical symptoms hampering nutritional intake, like pain, limited energy level, dysphagia, or side effects of medication (e.g., nausea and sickness). Moreover, participants reported the need to ingest their medication with food. Sometimes participants felt forced to eat.

In other participants, physical symptoms were not present or did not affect nutritional intake. Participants expressed that illness had to be (more) severe before it would affect their nutritional intake. Additionally, participants reported to adapt their nutritional intake based on comorbidities,

like diabetes, renal disease, or hypertension. Participants reported they had become accustomed to the adaptations, while others were disappointed with the nutritional constraints.

> *I have diabetes, I have a stoma, I am on dialysis, so there are quite a few things I have to take into account. Although it does not always happen as neatly, because they also say during dialysis: life must remain livable (P5).*

Participants reported that their financial position limited them to buy food, which they experienced as annoying and unfair. Furthermore, participants reported to eat less as side effect of ageing and limited physical activity.

Participants indicated to receive social support (e.g., help with grocery shopping and cooking). Some participants were not able to do these food-related activities, due to difficulties with walking and standing, pain and exertion. Participants experienced not or only partly doing the food-related activities as negative, as they liked doing those activities or liked doing the activities together with their partner. Some patients reported aids that helped them, such as using a mobile scooter. Furthermore, participants experienced eating together as pleasant. Participants reported eating together did not affect food choices or portion sizes, while others indicated that eating together did affect nutritional intake. Despite this support system, participants reported to be solely in control of what they eat. The opinion of others regarding their nutritional intake did not interest participants or did not affect their nutritional intake.

4) Limited nutritional advice

Most participants never received nutritional advice. When nutritional advice was received, sources of nutritional advice were consultation of a dietitian for advice regarding their

comorbidities or to lose weight, or nutritional advice during diabetes consultation or via domestic care.

> *We were told at the hospital, by the cardiologist, or by the nephrologist, that we should watch our salt intake, but apart from that, there was never really any guidance regarding nutrition. Actually, nobody says anything about it at all (P11).*

Participants indicated that they were not actively seeking nutritional advice and had no intention to do so. Participants perceived nutritional advice as unnecessary, because they were feeling well, indicated that they did not have a nutrition-related disease or problem that could be influenced by nutrition, or did not like to follow rules.

> *I do not have any interest in it [dietary advice] at all. I know I won't adhere to it anyway (P8).*

Other participants were open for nutritional advice, in case it may benefit their health. However, they did not plan actions to receive nutritional advice (passive approach).

> *If someone were to say, "you are not allowed to have this", then maybe I would possibly do it. I have not been to a dietitian or anything like that, so you just continue eating as you are used to (P9).*

5) Limited intention to change current nutritional intake

Participants expressed they had no idea what to change or expressed no need to change, as they were satisfied with the way they were eating, as no problems were stated, or as the food was tasty. Willingness to change nutritional intake was reported by participants when they were convinced that nutrition could benefit their well-being and health.

If that [adequate nutritional intake for wound healing] would actually help, then I think I would be willing to change something, but I do not believe it (P12).

Discussion

This study aimed to explore perceptions and experiences on nutrition of patients with CLTI and the perceived barriers and facilitators influencing their nutritional intake. Five themes were generated: (1) lack of nutritional risk perception, (2) role of nutrition for health, functioning and surviving, (3) multiple factors influencing nutritional intake, (4) limited nutritional advice, and (5) no intention to change current nutritional intake. Although nutritional intake was perceived as important and a necessity to survive and function, limited awareness and knowledge regarding adequate and healthy nutritional intake and undernutrition were found. Nutritional intake was mainly based on varying non-health related factors, as habits and taste. Barriers towards nutritional intake perceived by patients with CLTI include physical symptoms related to CLTI and medication, nutritional adaptations needed for comorbidities, and financial struggles. Moreover, participants indicated ageing, lower physical activity level, and limited nutritional knowledge to affect their nutritional intake. However, participants do not experience these factors as a barrier, because they did not express risk perception of an inadequate nutritional intake. Perceived facilitators for nutritional intake include tasty food, quitting smoking, limiting alcohol consumption, eating with others, a social support system to facilitate grocery and cooking, or the use of aid to perform nutrition-related activities.

The current study highlights a lack of risk perception regarding (risk for) undernutrition by patients with CLTI. Participants perceived (unintentional) weight loss as positive and did not recognize this as health risk, which is in line with previous research. A scoping review of qualitative studies in community dwelling older adults reported weight loss as a normal and

positive outcome, and part of the ageing process.[32] In the current study, participants with recent (unintentional) weight loss reported to eat less because of ageing and limited physical activity, and rationalized eating less as appropriate, even when having risk of undernutrition. Participants even reported the intention to lose more weight, which suggests insufficient knowledge about adequate nutrition related to their disease. This lack of risk perception regarding undernutrition is worrisome, as, consequently, patients are less likely to intentionally change their behavior to prevent or limit increased severity of undernutrition, leading to adverse clinical outcomes.[6, 12-14]

Participants demonstrated lack of nutrition-related knowledge and expressed no intention to seek nutritional advice or change their current nutritional intake. This finding can be explained by the I-change model describing that behavior is influenced by awareness, motivation, and action.[23] Our findings revealed limited awareness regarding the effect of adequate nutrition on health and clinical outcomes. Consequently, participants expressed no motivation and action to change their nutritional intake. This lack of awareness could be attributed to an information deficit, as participants indicated that they had not received nutritional advice. Participants even expressed reluctance to receive nutritional advice, due to negative experiences in the past and concerns about potential food restrictions. These findings stress the need for a patient-centered approach to nutritional care, considering individual preferences, to increase motivation.[33]

The finding that participants based their nutritional behavior mainly on taste preferences and habits, rather than being driven by health considerations, is in line with previous research. Healthy older adults expressed eating as an everyday phenomenon and not a health promoting phenomenon.[34] The importance of factors like taste and habits should be taken into account for future nutritional interventions, to enhance compliance and improve effectiveness. To improve intake, future interventions should also focus on limiting barriers related to nutritional intake, as

physical symptoms. For several participants, eating was experienced as a necessity to stay alive, and this was for them the sole reason for eating. This finding is in line with previous research, in which community dwelling older adults expressed to see food as an obligation.[32]

A strength of this qualitative study is the inclusion of a diverse CLTI population regarding age, sex, and educational level, to identify different perspectives. It should be noted that after approximately two-third of the interviews, limited new relevant information was identified, as the data were relatively homogeneous. Nevertheless, we continued the interview process aiming for a better in depth understanding of the perceptions and experiences by including various ways of questioning the same topic. Furthermore, a single interviewer conducted the interviews, which may have influenced interview style, interest, and emphasis. A limitation that should be noted is that the local dialect hindered communication between the researcher and participant during some interviews. This limitation did not influence further analyses as an author (RD) was familiar with this dialect assisted with transcription.

Conclusion

Patients with CLTI perceive nutritional intake as a necessity to survive and function. Patients express limited risk perception regarding adequate nutritional intake and undernutrition. Nutritional intake is mainly based on non-health related factors, as habits and taste, and multiple barriers hinder nutritional intake. Patients received no or only limited nutritional advice. Together this leads to an expressed lack of intention to change nutritional intake. Findings of this study stress the urgency for patient-centered nutritional support, to increase nutrition-related knowledge and motivation, to prevent or treat undernutrition, and may improve clinical outcomes in patients with CLTI.

Acknowledgements

We thank Dr. Samantha Rozevink for helping in the coding and Evelien Kolen for helping in transcribing. Furthermore, we thank the vascular surgeons, fellows vascular surgery, and medical administration from the UMCG and Ommelander Ziekenhuis Groningen for their assistance and contribution in the inclusion of participants.

Author contributions

Conceptualization, AK, HJ, JPdV, MD, PD, RD, LK, JG.; recruitment of participants, JPdV, MD.; conducting the interviews, AK.; interpretation, AK, HJ, JPdV, MD, PD, RD, LK, JG.; writing—original draft preparation, AK.; writing—review and editing, HJ, JPdV, MD, PD, RD, LK, JG.; supervision, HJ, RD, LK, JG.

Conflicts of interest

HJ was co-developer of the PG-SGA-based Pt-Global web tool.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Appendix

A. Standards for Reporting Qualitative Research (SRQR).

B. Interview guide.

C. Thematic map that includes the themes, sub-themes and codes.

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Table 1. Characteristics of the participants (n=12).

Participant	Sex	BMI	Education level	Smoker	Meeting Dutch physical activity guidelines	Pain score	Undernutrition risk*	Physical activity level†
1	M	Healthy weight	Moderate	Previous	Yes	5	Low	2.7
2	M	Overweight	Low	Yes	No	5	High	1.1
3	M	Overweight	Moderate	Yes	No	3	High	1.5
4	M	Healthy weight	Moderate	Previous	No	0	Low	6.4
5	F	Overweight	High	Previous	No	4	High	1.7
6	F	Overweight	Moderate	Yes	No	5	High	2.6
7	M	Obese	Low	Previous	No	8	High	7.2
8	F	Overweight	Low	Previous	No	0	High	2.0
9	F	Healthy weight	High	Never	No	4	Low	3.1
10	M	Overweight	Moderate	Previous	No	5	Low	2.2
11	F	Obese	Low	Never	No	0	High	0.6
12	F	Healthy weight	Moderate	Never	No	5	Mod	1.4

* Assessed by PG-SGA SF. † Assessed by PASIPD. Abbreviations: M = male, F = female.

Educational level: low: elementary or high school; moderate: vocational college; high: (applied) university.

PASIPD scores can range from 0 to 182.3 MET hours/day, as question 10 and 11 were combined [28, 29].

Table 2. Themes and sub-themes.

Theme		Sub-theme
1	Lack of nutritional risk perception	Insufficient awareness of factors causing weight loss
		Perception regarding weight change
		Limited intention regarding weight change
		Loss of muscle mass and/or strength
2	Role of nutrition for health, functioning and surviving	Eating to survive and function
		Limited knowledge about the role of nutrition in health and disease
3	Multiple factors influencing nutritional intake	Health-related factors
		Dietary decisions beyond health considerations
		Nutritional impact symptoms
		Dietary restrictions
		Non-health-related factors
		Eating according to personal taste preferences
		Nutritional intake is habit-driven
		Financial situation
		Older age
		Help and support by peers
4	Limited nutritional advice	Limited sources of nutritional advice
		Lack of intention to obtain nutritional advice
5	Limited intention to change current nutritional intake	Satisfied with current nutritional intake
		Willingness to change

Highlights

- Patients with chronic limb threatening ischemia express limited risk perception regarding adequate nutritional intake and undernutrition.
- No or only limited nutritional advice is received, and patients express no intention to seek nutritional advice or change current nutritional intake.
- Nutritional behavior is mainly based on non-health related factors, as habits and taste, and multiple barriers hinder nutritional intake.
- Patient-centered nutritional support, to increase nutrition-related knowledge and motivation, to prevent or treat undernutrition is needed, and may improve clinical outcomes.