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Opinions and practices of healthcare professionals on assessment of disease associated malnutrition in children: results from an international survey

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Abstract

Background and Aims: Lack of consensus on clinical indicators for the assessment of pediatric disease associated malnutrition (DAM) may explain its under-recognition in clinical practice. This study surveyed the opinions of health professionals (HP) on clinical indicators of DAM and barriers impeding routine nutritional screening in children.

Methods: Web-based questionnaire survey (April 2013 - August 2015) in Australia, Belgium, Israel, Spain, The Netherlands, Turkey and UK.

Results: There were 937 questionnaires returned via local professional associations, of which 693 respondents fulfilled the inclusion criteria and were included in the final analysis; 315 pediatric gastroenterologists and 378 pediatric dieticians. The most important clinical indicators of DAM were ongoing weight loss (80.4%), increased energy/nutrient losses (73.0%), suboptimal energy/macronutrient intake (68.6%), a high nutritional risk condition (67.2%) and increased energy/nutrient requirements (66.2%). These findings were consistent across countries and professions. The most common approach to screen for DAM was assessment of weight changes (85%), followed by the usage of growth charts (77-80%). Common perceived barriers for routine nutritional screening/assessment were low staff awareness (47.5%), no local policy or guidelines (33.4%) and lack of time to screen (33.4%).

Conclusions: HP who routinely assess and treat children with DAM identified ongoing weight loss, increased losses, increased requirements, low intake and high nutritional risk conditions as the most important clinical indicators of DAM. These clinical indicators should now serve as a basis to form clinical-based criteria for the identification of DAM in routine clinical practice. Low awareness, lack of guidelines or local policy and lack of resources were the most important barriers of routine screening.

Introduction

Despite continuous efforts from health professional associations to increase nutrition awareness and to improve early detection and management, a decrease in the prevalence of disease associated malnutrition (DAM) in hospitalized children in developed countries, has not been observed over the last decade[1]. Although the reasons for lack of progression in this area remain elusive, it is believed that the absence of a clinically and universally accepted way to assess and screen DAM delays timely identification and treatment. It is also becoming more recognized that the WHO criteria for screening of acute and chronic malnutrition in communities of low-medium income countries, may be inappropriate for use in the context of DAM, where its etiology is multifactorial and complicated by the background illness. In health services of affluent countries, there is also increasing interest in the prevention of DAM. Early management of patients whose nutritional status deteriorates is of utmost importance in such settings.

Previous research proposed measurements and frameworks to define pediatric DAM; with some focusing on the measurable consequences of DAM on body size [2] and composition [3]. Likewise, others incorporated information on etiology, chronicity and the effect of inflammation and clinical outcomes [4]. The extent to which such proposals have been integrated and apply in routine clinical practice remains unknown.

As evidence-based approaches or experts consensus do not often echo in clinical practice, an alternative to these approaches, is to survey the opinions and practices of health professionals (HP) who routinely identify and treat children with DAM. While such an approach may not be considered evidence-based, it is a pragmatic one and has clinical relevance.

The aims of this study were:

1. To survey the opinions of HP practitioners on clinical indicators of children who suffer or are at risk of DAM.
2. To propose clinical measurements and indicators of DAM based on the preponderance of HP responses.
3. To collect responders' perceptions on barriers of routine nutritional screening.

Methods

Survey population

As the objective of this survey was to collect opinions of HP who are the most likely to be involved in nutritional care of pediatric patients, the survey targeted pediatric gastroenterologists and pediatric dietitians with practicing experience in pediatric nutrition care. Responders who did not meet these inclusion criteria were excluded. A questionnaire survey was developed and distributed via the local professional associations of the participating countries (Australia, Belgium, Israel, Spain, The Netherlands, Turkey and UK) using the SurveyMonkey® website. As there is no formal Belgian professional group for pediatric dieticians, no dieticians were included from this country. Two reminders were sent with a two-week interval to all participants. The survey was anonymous and a prize draw of £100 was used as an incentive.

Survey design and data collection

A draft questionnaire was collated by two experts in the field of pediatric malnutrition screening (KG, JH). The questionnaire included a total of 16 multiple-choice and open-ended questions to elicit additional responses. The questions were divided into three sections. The first section collected information about the responders and their area of practice. Responses on this section were used to filter out responders who did not meet the inclusion criteria described above. The second section questioned the degree of importance of various features as clinical indicators of DAM and nutritional risk. This section was split into three subsections, each listing the following indicators of DAM: a) anthropometry and body composition, b) dietary intake and requirements, and c) a miscellaneous group encompassing features like inflammation, functional capacity and biomarkers of nutritional status. The third section focused on nutritional screening methods, causes and long-term consequences of DAM and main barriers perceived to routine evaluation of nutritional status. An English version of the survey is available in **Supplementary file 1.**

Face-validity and readability of the questionnaire were tested by dietitians and pediatric gastroenterologists at the Royal Hospital for Children in Glasgow. The original questionnaire developed in English was translated to five different languages (Dutch, French, Hebrew, Spanish and Turkish) and then translated back into English to avoid language bias. The questionnaire was sent out between April 2013 and August 2015.

Statistical analysis

Statistical analysis was performed using R [5]. Differences in proportions between groups were analyzed using χ^2-test or Fisher's exact test. In reporting of categorical data, weighted analysis was applied in which each country received a weight of 1, regardless of the number of respondents of that country. This avoided bias due to different number of responders per country. A p-value of <0.050 was considered statistically significant.

Results

Respondent characteristics and data cleaning

From a total of 937 respondents, 693 (74.0%) were taken forward to the final analysis after data curation. As 109 (11.6%) respondents (Australia: n=4, Israel: n=71, Spain: n=24 and Turkey: n=1, The Netherlands: n=2 and UK: n=7) did not indicate to have clinical experience in pediatric medicine; 12 (1.3%; Australia: n=1, Israel: n=1, UK: n=10) or had a different or undisclosed profession than medical doctors (MD) or dieticians (RD), their responses were removed. Another 123 (13.1%) respondents were filtered out as they were not pediatric gastroenterologists or disclosed no expertise in nutrition **(Supplementary file 2**). Using the weighed statistical analysis approach, cumulative responses for each question received a relative weight of 1.1 for Australia; 2.9 for Belgium; 0.8 for Israel; 0.7 for Spain; 1.4 for The Netherlands; 1.3 for Turkey and 0.6 for the UK.

Overall, 75.2% (521/693) of the respondents answered ≥95% of the questions in the questionnaire. None of the questions were systematically omitted by the respondents. An overview of the characteristics of the respondents by country is displayed in **Table 1**. Dieticians had significantly fewer years of clinical experience (p-values <0.010) than MDs in all countries, except for The Netherlands (p=0.379). A significantly (p<0.001) higher proportion of MD (62.7%) than RD (40.4%) worked in a tertiary setting.

Clinical indicators of disease associated malnutrition

Overall results

The degree of importance of anthropometry and body composition measurements, dietary intake, nutritional requirements and other features, as clinical indicators of DAM and nutritional risk, are presented per country in **Figure 1** and per profession in **Figure 2**. No differences were found between weighted or unweighted statistical analysis. The top five clinical indicators of DAM deemed the most important, were ongoing weight loss (80.4% highly important), increased energy/nutrient losses (73.0% highly important), suboptimal energy/macronutrient intake (68.6% highly important), a history of high nutritional risk condition (67.2% highly important) and increased energy/nutrient requirements (66.2% highly important). These results were largely consistent between the two professions and among the different countries (**Figures 1 and 2**). Likewise, the three least important clinical indicators of DAM were low fat but normal lean stores (31.3% not or slightly important), low activity levels (16.6% not or slightly important) and the age of the patient (13.9% not or slightly important). Less agreement was found for the least important clinical indicators between the professional designation of responders and across countries (**Figures 1 and 2**).

Anthropometric and body composition as clinical indicators of DAM

On ranking the importance of anthropometry and body composition as clinical indicators of DAM risk in children (**Panels A of Figures 1 and 2**), the top three ranked responses were weight loss (80.4% highly important), a low BMI/weight-for-height measurement (47.3% highly important) and low fat and lean stores (42.6% highly important). Likewise, the least important indicator of DAM was low fat stores, in the presence of normal lean mass levels (31.3% not or slightly important). The distribution of responses varied across countries (p-values <0.001) for all indicators and between RD and MD for ongoing weight loss (p<0.001) and low fat with normal lean body mass (p=0.025).

Intake & requirements as clinical indicators of DAM

The importance the respondents attributed to various intake & requirement aspects as indicators of DAM is represented in **Panels B of Figures 1 and 2**. The three indicators of DAM that ranked the highest were increased energy/nutrient losses (73.0% highly important), suboptimal energy/macronutrient intake (68.6% highly important) and a history of high nutritional risk condition (67.2% highly important). Suboptimal micronutrient intake ranked the least important (39.9% highly important). Responses varied (all p-values <0.050) for all indicators across countries and between RD and MD (except for altered requirements due to impaired nutrient metabolism: p=0.560).

Other clinical indicators of DAM

Panels C of Figures 1 and 2 display the importance of other features or measurements as clinical indicators of DAM in sick children. Abnormal blood markers indicating poor nutritional status was selected most frequently as a highly important indicator of DAM (49.6%). This was followed by prematurity (32.9% highly important) and the presence of systemic inflammatory response (24.9% highly important). Low activity (16.6% not or slightly important) was the least important indicator of DAM. No significant differences (all p-values >0.050) were found for all indicators between RD and MD (except for age of the child and prematurity: p<0.001), but differences (p-values <0.010) across countries were noted for all these indicators, except for the importance attributed to a child with low activity (p=0.128).

Etiology and consequences of DAM

From the four available options, suboptimal intake ranked the most important cause (44.7% of the responders) and inflammatory response the least important (42.8%) (**Supplementary files**

3A&B). Significant ($p<0.001$) differences in responses were observed across countries and professions, although results were more consistent with regard to suboptimal intake which ranked as the most important cause of DAM for all countries.

Considering the long-term consequences of DAM in sick children, increased complication rate (71.5%), poor growth (71.5%), poor cognitive development (34.9%), slower disease recovery (32.2%) and an impaired immune function (23.1%) were most commonly selected as the “top three” consequences of DAM (**Supplementary files 3C&D**).

Assessment and screening of DAM in routine clinical practice

A total of 588 (84.8%) HP responded to the question regarding screening and assessment of DAM in routine clinical practice (**Figure 3**). Of these, 7% did not routinely screen for malnutrition (most frequent in Australia (16%) and the least frequent (0%) in The Netherlands; difference across countries: $p=0.012$). The most common approach to screen for DAM was assessment of weight changes (85%), followed by the usage of growth charts (77-80%; the latter one done by a higher proportion of MDs than RDs (p-values <0.050). Usage of nutritional screening tools was reported in 23% of responders (Belgium, the Netherlands and UK: 40-50%, other countries ≤15%, $p<0.001$). Differences were noted between the countries in the way DAM was screened in routine clinical practice (**Figure 3**). This was the case for all available options, except for plotting of anthropometry on growth charts and classification of DAM risk based on the underlying/chronic condition, which were consistent among countries. Assessment of dietary intake as a screening method of DAM was performed significantly ($p<0.001$) more often by RD (second most common approach) than MD (fifth most common approach). MD performed more frequently laboratory testing as compared to RD ($p<0.001$) to screen for DAM. Functional tests (e.g. grip strength) or energy levels were assessed only by a minority of the respondents.

Perceived barriers to the routine evaluation of DAM in clinical practice

A minority of respondents (77/583, 13.2%) did not perceive barriers for routine evaluation of DAM in routine clinical practice (most frequently in the UK: 22.9%); although differences were found between countries (p=0.003). A detailed overview of barriers by country and by profession is presented in **Table 2** and in **Supplementary file 4** respectively. The three most commonly perceived barriers, were low staff awareness on the role of nutrition on patient care (47.5%), absence of local policy or guidelines to screen (33.4%) and lack of time to screen (33.4%) for DAM. Likewise, inadequate clinical management pathways to intervene on undernourished children (14.6%) and a lower priority recognized to nutritional care as opposed to other aspects of patients' care (13.4%) were least frequently selected. Barriers of routine evaluation of DAM in clinical practice varied across countries (**Table 2**). MD were more likely to experience the aforementioned barriers than RD, except for a lack of screening method (p=0.075), inadequate management strategies to intervene (p=0.074) and a lack of importance attributed to nutrition compared to other aspects of patients' care (p=0.148). In contrast, a lack of a local policy to screen for DAM was more frequently (p=0.010) reported as a barrier by RD (38.2%) than MD (28.2%).

Discussion

This study is the first to investigate the opinions and practices of an international cohort of HP on aspects pertinent to pediatric DAM. Ongoing weight loss, increased losses, increased requirements, low dietary intake and a high risk condition ranked as the most important clinical indicators of children with DAM. These top five clinical indicators of a child at risk of DAM were remarkably consistent across different countries. Evaluation of weight changes also featured as the most common approach to screen for DAM in routine clinical practice. Low staff awareness on the role of nutrition in patient care, lack of local policy or guidelines to screen for DAM and lack of time to screen were the most commonly reported barriers for routine nutritional screening.

DAM in children is the consequence of a complex interplay of various etiological factors, making it a condition that is difficult to evaluate with a single measurement or biomarker. While there is still debate about the optimal definition and measurement of DAM, and until evidence from intervention studies become available, these top five clinical indicators identified in this survey can serve as the basis to formulate universal, practice-based, screening and assessment criteria for the identification of DAM in routine clinical practice. It is noteworthy, that similar indicators were proposed by a recent consensus statement published by the Academy of Nutrition and Dietetics and the American Society for Parenteral and Enteral Nutrition [6]. A decline in weight velocity and unintentional weight loss, were highlighted as the most important indicators and measurements of DAM and were deemed more important than a static measurement of low BMI. Moreover, the importance that was attributed to weight loss and a decline in weight velocity was consistent between countries and type of HP and it suggests that weight loss has a stronger predictive value, than low BMI alone, to indicate children at risk of DAM. While the exact cutoffs of growth faltering are still under debate, a sustained unintentional weight loss or poor weight gain should be a "never event" for children with illness [7]. Low intake, increased losses and increased requirements were selected as other important indicators of DAM in this survey and these findings are in agreement with aspects of the etiological definition of DAM recently proposed by Mehta *et al* [4]. Assessing the origins of DAM is imperative to implement appropriate nutritional interventions and distinguish poor linear growth due to genetic disorders, from insufficient caloric intake, the independent effect of inflammatory response or an interaction of all. Against our expectations and consensus recommendations and guidelines, little importance has been placed by the responders to the assessment of body composition as an indicator of DAM. There is good research evidence to suggest that children with chronic inflammatory conditions have altered body composition characteristics [8] but as it is yet unclear what the implications of this are, with regard to patients outcomes and direct clinical management, it is not surprising that clinical practitioners do not value its importance in routine practice. Availability of equipment to assess body composition could also play a role, which is something we did not assess in our survey. Incorporation of inflammatory process in the assessment framework of DAM is currently debated [9]. In this regard, only a quarter of our responders attributed high importance to the role of inflammation as indicator and measurement of DAM; a finding which challenges the proposal of Mehta based on the available peer-reviewed literature [4]. This is likely to suggest a lack of translation of research evidence to bedside practice or that HP do not value the effect of inflammatory response on DAM as important, particularly when the latter is often difficult to ascertain or measure. It might also be that the effect of inflammation on DAM overlaps with the effect of presence of a high nutritional risk condition that our participants valued among the top indicators of DAM; although not all conditions which lead to malnutrition are associated with inflammation.

A quarter of the respondents used validated nutritional screening tools as a method of choice to screen for DAM, even though their use has been supported by several health professional bodies [4, 10, 11]. Neither a large European study nor a systematic review of other, smaller studies provided sufficient evidence to recommend one screening tool over another which may explain these findings [12, 13].

Low staff awareness on nutrition, lack of time and lack of local guidelines for nutrition screening were the most important barriers to the routine evaluation of DAM. These results are very similar to the findings of a Belgian survey in secondary care hospitals [14]. The differences across countries in the perceived barriers of routine evaluation of DAM may reflect variation in health practices, resources and agreed health priorities across countries. For example, a lack of personnel and/or dieticians was more of an issue in Spain, Turkey, Belgium and the UK, whereas inadequate equipment was of concern mainly in Spain and Israel. Whether this is true, or rather a perception is impossible to address and it is beyond the scope of this survey. Jointly these findings prove that even though the scientific community has raised awareness on pediatric DAM, more evidence is required to prove the clinical benefit of nutritional screening in clinical practice. More and better quality evidence, deriving from intervention studies, are needed to demonstrate that implementation of nutritional screening at hospital routine can improve patients' outcomes and reduce health expenditure.

The major strengths of this study are the large number and international representation of respondents and the fact that we only surveyed participants with clinical experience in pediatric nutrition care. Even though the survey was distributed via local professional associations of participating countries, we were unable to ensure the representation of our population. Although the number of respondents was unevenly distributed over the different countries, we overcame this potential limitation by performing weighted analyses. Lastly, while this study helps us in identifying the most important clinical indicators of DAM, it does not answer the question which screening or assessment thresholds should be applied for further nutritional assessment or intervention. This is an aspect which needs to be explored in future research. As this survey was conducted in developed countries, it may not represent the HP opinions of DAM in low-medium income countries.

Conclusion

This survey identified ongoing weight loss, increased nutrient losses, increased requirements, low intake and a high risk condition as the most valued clinical indicators of DAM by HP who routinely assess and treat children with DAM. These indicators should serve as a basis to form consensus, clinical-based criteria for screening and assessment of DAM. Low awareness, lack of guidelines or local policy and lack of resources were the most important barriers of routine screening. More and better quality of evidence is required to inform the benefit of nutritional screening and overcome barriers in its routine implementation.

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Statement of Authorship

J Hulst and K Gerasimidis conceptualized and designed the study, reviewed and revised the manuscript, and approved the final manuscript as submitted.

K Huysentruyt carried out the initial analysis, drafted the initial manuscript, revised and approved the final manuscript as submitted.

F Bian, R Shamir, M White, R Galera-Martinez, A Morais-Lopez and A Kansu collected or supervised data collection at different sites, critically reviewed the manuscript, and approved the final manuscript as submitted.

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Figure 1. Importance of various clinical indicators of disease associated malnutrition across different countries

N/A: not answered

Figure 2. Importance of various clinical indicators of disease associated malnutrition across different professions

N/A: not answered; RD: dieticians; MD: medical doctor

Figure 3. Assessment of disease associated malnutrition and nutritional risk in clinical practice

N/A: not answered; RD: dieticians; MD: medical doctor

Table 1. Respondent characteristics

Table 2. Barriers to the routine evaluation of nutritional status by country

Table 1. Respondent characteristics

	Total n	Australia n (%)	Belgium n (%)	Israel n (%)	The Netherlands n (%)	Spain n (%)	Turkey n (%)	UK n (%)	p-value
Profession									<0.001
MD	315	9 (2.9)	34 (10.8)	17 (5.4)	45 (14.3)	119 (37.8)	57 (18.1)	34 (10.8)	
RD	378	80 (21.2)	-	109 (28.8)	28 (7.4)	20 (5.3)	22 (5.8)	119 (31.5)	
Paediatric experience (years)*	693	6.0 (1-40)	13.0 (3-41)	7.0 (1-46)	15 (1-40)	12.0 (1-45)	14.0 (1-45)	11.0 (1-35)	<0.001
Health care setting**	690								
General Hospital	460	29 (12.6)	18 (7.8)	40 (17.4)	28 (12.2)	46 (20.0)	15 (6.5)	54 (23.5)	0.026
Specialist Hospital	349	51 (14.6)	19 (5.4)	28 (8.0)	44 (12.6)	76 (21.8)	58 (16.6)	73 (20.9)	<0.001
Community	126	10 (7.9)	0 (0)	79 (62.7)	0 (0)	7 (5.6)	2 (1.6)	28 (22.2)	<0.001
Private care	73	3 (4.1)	0 (0)	35 (47.9)	0 (0)	29 (39.7)	4 (5.5)	2 (2.7)	<0.001
Primary care	20	3 (15.0)	2 (10.0)	5 (25.0)	0 (0)	2 (10.0)	0 (0)	8 (40.0)	0.116
N/A	3	0	0	0	1 (33.3)	0	1 (33.3)	1 (33.3)	
Highest educational degree	669								<0.001
BSc	240	53 (22.1)	0 (0)	64 (26.7)	19 (7.9)	1 (0.4)	4 (1.7)	99 (41.3)	

MSc	109	23 (21.1)	1 (0.9)	41 (37.6)	2 (1.8)	24 (22.0)	0 (0)	18 (16.5)
MD	273	8 (2.9)	26 (9.5)	12 (4.4)	25 (9.2)	109 (39.9)	62 (22.7)	31 (11.4)
PhD	47	4 (8.5)	7 (14.9)	4 (8.5)	22 (46.8)	4 (8.5)	1 (2.1)	5 (10.6)
N/A	24	1 (4.2)	0 (0)	5 (20.8)	5 (20.8)	1 (4.2)	12 (50.0)	0 (0)

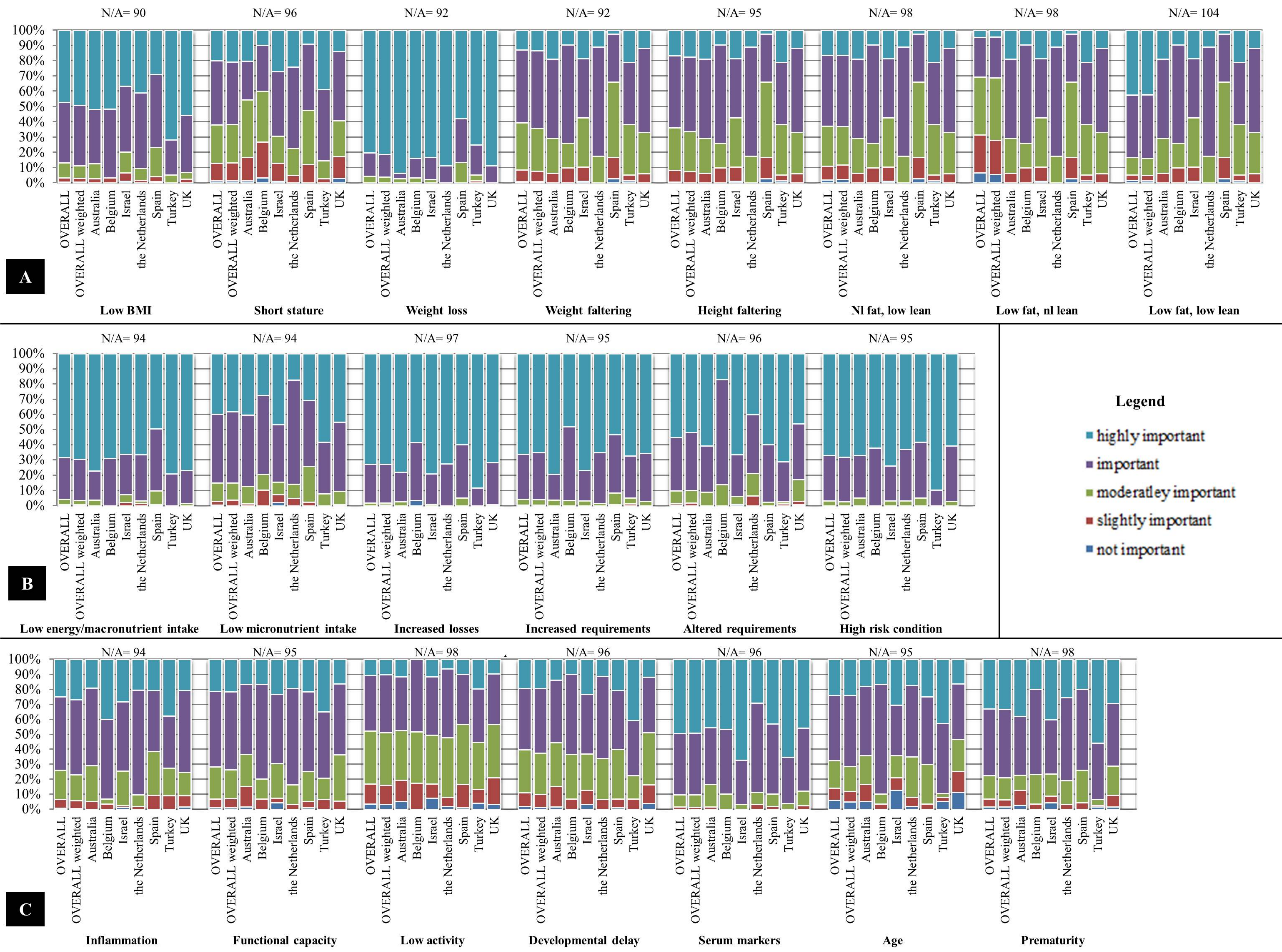
**median (range); **multiple answers possible per respondent; N/A: not answered; BSc: Bachelor in Science; MSc: Master in Science; MD: medical doctor; RD: Registered dietitians; PhD: doctor of philosophy*

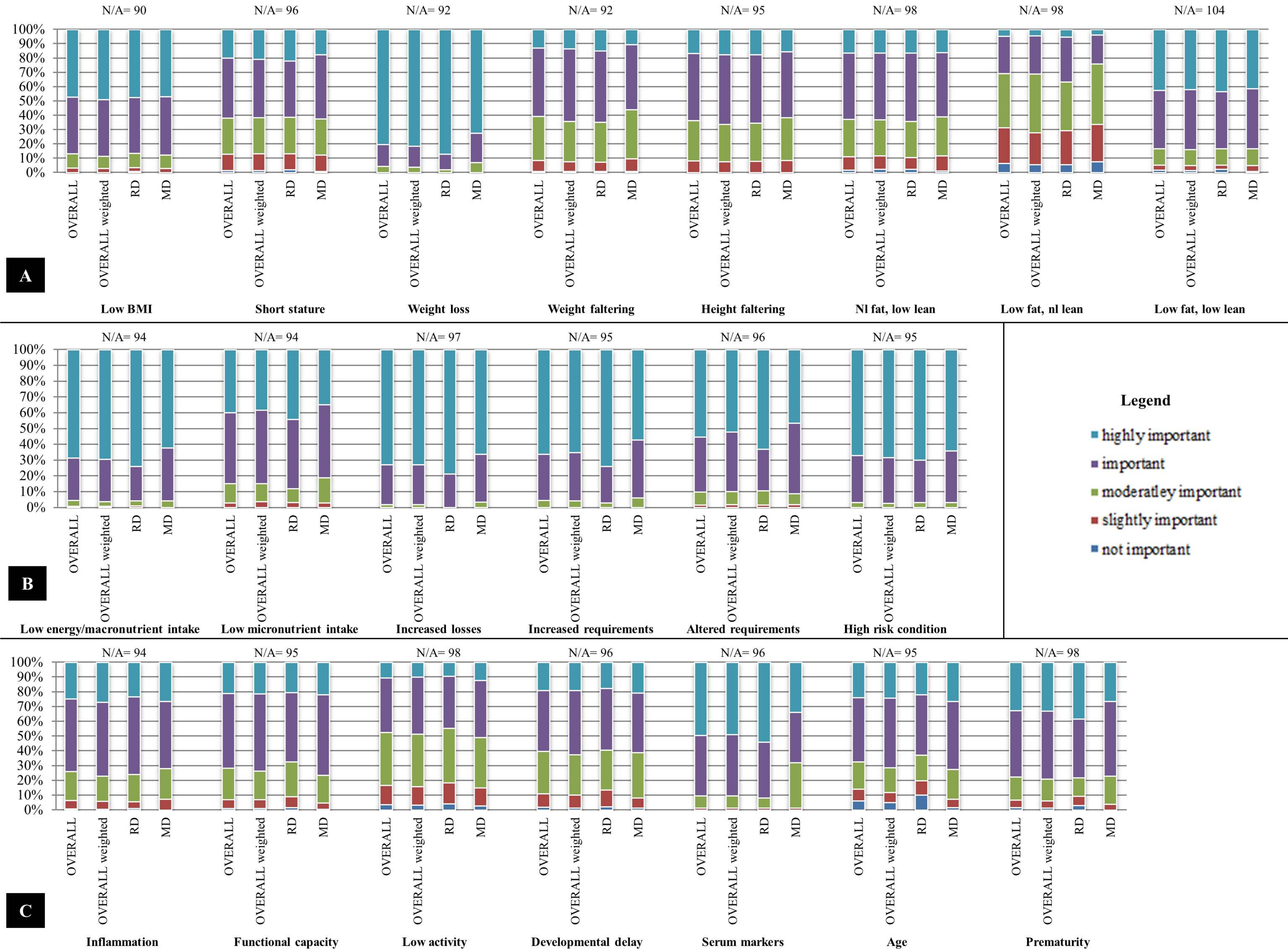
Table 2. Barriers to the routine evaluation of nutritional status by country

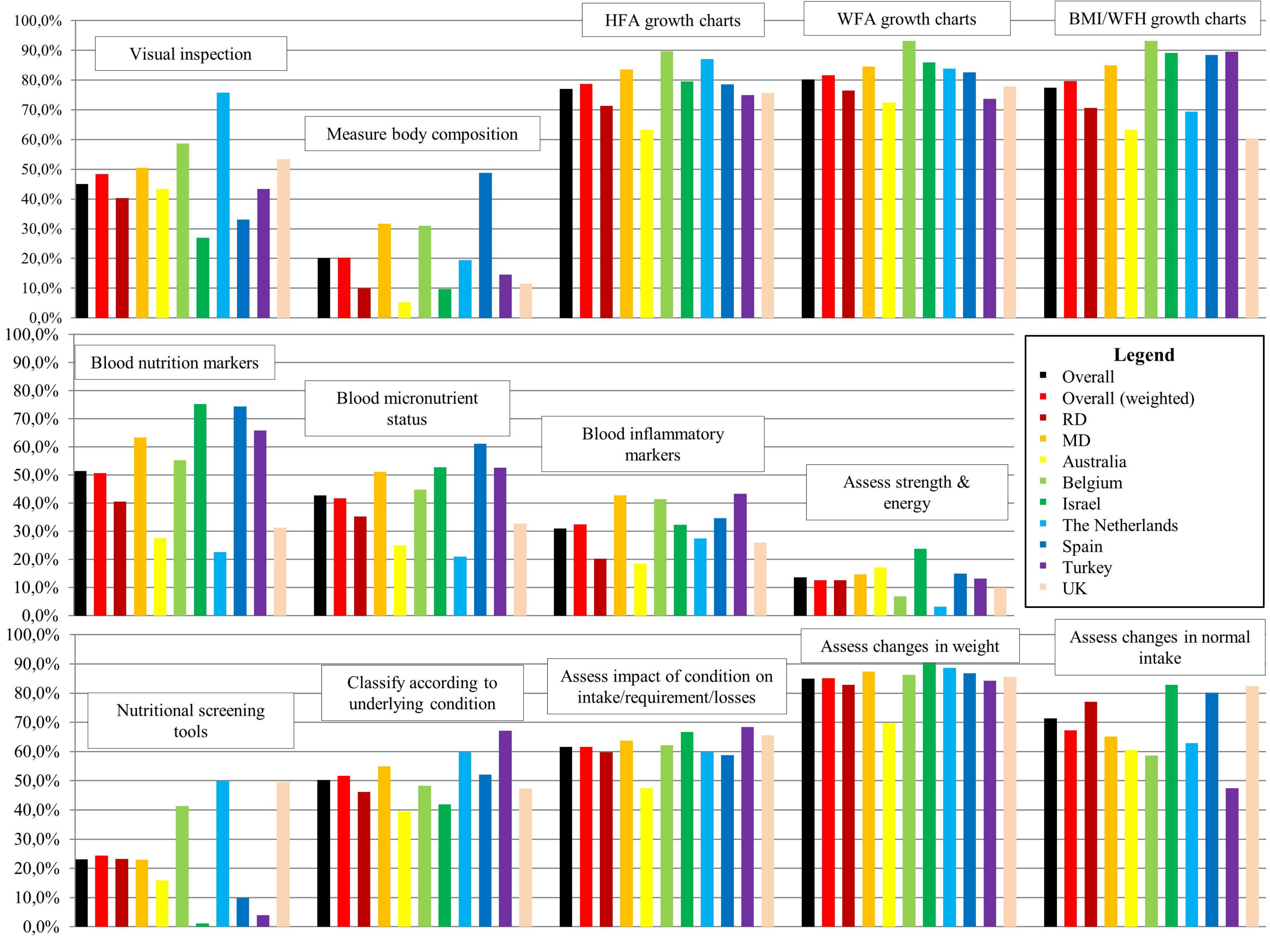
	Total n (%)	Australia n (%)	Belgium n (%)	Israel n (%)	Netherlands n (%)	Spain n (%)	Turkey n (%)	UK n (%)	p-value
No barriers	77 (13.2)	7 (9.5)	5 (17.2)	11 (12.1)	10 (16.4)	7 (5.8)	7 (9.2)	30 (22.9)	0.003
Low staff awareness	277 (47.5)	39 (52.7)	6 (20.7)	28 (30.8)	22 (36.1)	87 (71.9)	47 (61.8)	48 (36.6)	<0.001
No local policy or guidelines	195 (33.4)	39 (52.7)	10 (34.5)	41 (45.1)	9 (14.8)	39 (32.2)	26 (34.2)	31 (23.7)	<0.001
Lack of time	195 (33.4)	19 (25.7)	12 (41.4)	29 (31.9)	12 (19.7)	48 (39.7)	37 (48.7)	38 (29.0)	0.004
Not many dieticians to intervene	191 (32.8)	13 (17.6)	8 (27.6)	12 (13.2)	13 (21.3)	75 (62.0)	39 (51.3)	31 (23.7)	<0.001
No training	181 (31.0)	21 (28.4)	14 (48.3)	30 (33.0)	15 (24.6)	54 (44.6)	22 (28.9)	25 (19.1)	<0.001
No method in place for screening	137 (23.5)	32 (43.2)	4 (13.8)	27 (29.7)	4 (6.6)	47 (38.8)	4 (5.3)	19 (14.5)	<0.001
Lack of staff	137 (23.5)	18 (24.3)	4 (13.8)	16 (17.6)	8 (13.1)	48 (39.7)	17 (22.4)	26 (19.8)	<0.001
Lack of nutrition support teams	128 (22.0)	19 (25.7)	9 (31.0)	14 (15.4)	7 (11.5)	33 (27.3)	22 (28.9)	24 (18.3)	0.038
Inadequate equipment	125 (21.4)	15 (20.3)	3 (10.3)	25 (27.5)	3 (4.9)	50 (41.3)	11 (14.5)	18 (13.7)	<0.001
Inadequate strategies to intervene	85 (14.6)	6 (8.1)	0 (0)	15 (16.5)	3 (4.9)	26 (21.5)	22 (28.9)	13 (9.9)	<0.001

Nutrition less important than other aspects of patient care	78 (13.4)	5 (6.8)	6 (20.7)	4 (4.4)	23 (37.7)	6 (5.0)	18 (23.7)	16 (12.2)	<0.001

Not answered: n= 110


A
N/A= 90
Low BMI
N/A= 96
Short stature
N/A= 92
Weight loss
N/A= 92
Weight faltering
N/A= 95
Height faltering
N/A= 98
Nl fat, low lean
N/A= 98
Low fat, nl lean
N/A= 104
Low fat, low lean
B
N/A= 94
Low energy/macronutrient intake
N/A= 94
Low micronutrient intake
N/A= 97
Increased losses
N/A= 95
Increased requirements
N/A= 96
Altered requirements
N/A= 95
High risk condition
C
N/A= 94
Inflammation
N/A= 95
Functional capacity
N/A= 98
Low activity
N/A= 96
Developmental delay
N/A= 96
Serum markers
N/A= 95
Age
N/A= 98
Prematurity
OVERALL
OVERALL weighted
Australia
Belgium
Israel
the Netherlands
Spain
Turkey
UK
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Legend
highly important
important
moderatley important
slightly important
not important


A
N/A= 90
N/A= 96
N/A= 92
N/A= 92
N/A= 95
N/A= 98
N/A= 98
N/A= 104
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
OVERALL
OVERALL weighted
RD
MD
Low BMI
Short stature
Weight loss
Weight faltering
Height faltering
Nl fat, low lean
Low fat, nl lean
Low fat, low lean
B
N/A= 94
N/A= 94
N/A= 97
N/A= 95
N/A= 96
N/A= 95
Low energy/macronutrient intake
Low micronutrient intake
Increased losses
Increased requirements
Altered requirements
High risk condition
Legend
highly important
important
moderatley important
slightly important
not important
C
N/A= 94
N/A= 95
N/A= 98
N/A= 96
N/A= 96
N/A= 95
N/A= 98
Inflammation
Functional capacity
Low activity
Developmental delay
Serum markers
Age
Prematurity


Visual inspection
Measure body composition
HFA growth charts
WFA growth charts
BMI/WFH growth charts
Blood nutrition markers
Blood micronutrient status
Blood inflammatory markers
Assess strength & energy
Nutritional screening tools
Classify according to underlying condition
Assess impact of condition on intake/requirement/losses
Assess changes in weight
Assess changes in normal intake
100,0%
90,0%
80,0%
70,0%
60,0%
50,0%
40,0%
30,0%
20,0%
10,0%
0,0%
Legend
Overall
Overall (weighted)
RD
MD
Australia
Belgium
Israel
The Netherlands
Spain
Turkey
UK