

Original Article

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Referral criteria recognition of screeners in the Danish screening programme for hip dysplasia

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ABSTRACT

INTRODUCTION. The aim of this study was to review risk factors used in the current Danish screening programme for developmental dysplasia of the hip (DDH) and the self-reported recognition of these risk factors among midwives, general practitioners (GP) and GPs in training.

METHODS. A survey of regional DDH referral guidelines was conducted through online regional guideline databases. Furthermore, risk factors used as referral criteria for DDH were compared across regions.

Using an online survey, we asked midwives, GPs and GPs in training to identify which of six risk factors for DDH were currently featured as referral criteria for specialised DDH examination in the referral guidelines of their employment region. Answers were compared with the DDH referral guidelines of the responders' employment region.

RESULTS. We collected 178 survey responses and 11 local and regional DDH referral guidelines. Six risk factors were identified from referral guidelines (breech presentation, oligohydramnios, family history of DDH, clubfeet, twins and premature birth). Overall, correct answer percentages for currently used risk factors for DDH as specified in the corresponding regional guidelines were: 96% (breech presentation), 90% (family history of DDH), 66% (twins), 63% (premature birth), 34% (clubfeet) and 29% (oligohydramnios).

CONCLUSIONS. This study found variation in the referral criteria among Danish regional DDH referral guidelines and an overall high level of recognition for two out of six referral criteria but a low level of recognition for the remaining four.

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TRIAL REGISTRATION. not relevant.

Developmental dysplasia of the hip (DDH) is a hip malformation disorder ranging from mild structural abnormalities of the acetabulum or femur to complete hip dislocation. DDH has an annual incidence rate of 0.7-1.0% of newborn children [1, 2] and is the most common orthopaedic disorder in neonates.

A selective ultrasound screening programme for DDH has been implemented in all regions of Denmark. The programme consists of universal clinical screening by midwives and general practitioners (GPs) according to the national recommendations from the Danish Health Authority [3] followed by a selective ultrasound screening for at-risk newborns based on risk factors for DDH featured in local and regional referral guidelines. No national coordination exists between the universal and selective screening programmes.

The knowledge of correct referral criteria is imperative for any screening programme to be effective. Even so, and despite abundant research in the field of DDH screening, no studies have been published focusing on the self-reported level of knowledge of referral criteria among referrers in a selective screening programme for DDH. Incorrect DDH referrals for paediatric orthopaedic consultation are not uncommon [4], and increasing referral rates are observed when expanding the group of referrers to include health professionals who are not specialised in paediatric hip disorders. These increases, however, do not produce a corresponding increase in diagnosis and treatment [1, 5].

The aim of this study was to review the status of risk factors used as referral criteria in the current Danish DDH screening programme. This was accomplished by examining regional guidelines and self-reported knowledge of these risk factors among health professionals performing primary DDH screening (midwives, GPs and GPs in training).

METHODS

This was a cross-sectional study based on an open online-survey and review of current DDH referral guidelines from all five geographical regions in Denmark. Reporting follows the CHERRIES guidelines for reporting web-based surveys [6].

In September 2020, we searched for current guidelines for DDH screening and referral in online regional guideline databases using the query terms: DEVELOPMENTAL DYSPLASIA OF THE HIP, CONGENITAL HIP DISLOCATION, HIP DYSPLASIA, ACETABULAR DYSPLASIA and NEONATAL HIP DISLOCATION.

Data protection

Questionnaire data were stored in REDCap, an online Health Insurance Portability and Accountability Act/General Data Protection Regulation compliant database hosted at Aalborg University Hospital, Denmark. Only the primary author of this study had access to the survey data. No sensitive personal data was collected for this study.

Recruitment process

E-mail invitations were sent to a group of GPs in the North Denmark and Central Denmark regions. The GPs were compensated for their time at a rate they agreed upon with the Centre for General Practice, Aalborg University, Denmark. Compensation reflected the time spent answering the survey.

Due to a low initial response rate to e-mail invitations, we expanded the invitations to include midwives, GPs and GPs in training by advertising in closed social media fora for midwives and physicians. No financial incentives were given to this group.

Responses were collected from June 2020 to September 2020.

Participants

The inclusion criteria were: Health professionals performing primary DDH screening and DDH referrals for ultrasound (certified midwife, certified GP or GP in training) currently employed at a hospital or general practice in one of the five Danish geographical regions.

We excluded questionnaires not marked as complete and responders with previous orthopaedic or paediatric employment or training. All responders were instructed to complete the survey once only; IP address checks and cookie checks for multiple entries were not utilised.

Questionnaire development

The questionnaire was constructed by the author group based on review of the literature and DDH referral guidelines, and was pilot tested by three external paediatric orthopaedic surgeons and two GPs, which triggered clarifying edits. No changes were made to the questionnaire after this stage.

Responders were invited to complete a multiple-choice questionnaire in which they needed to state which of six given options (breech presentation, twins, clubfeet, family history of DDH, oligohydramnios and premature birth with birthweight < 1,500 g) were risk factors for DDH currently used as referral criteria for further diagnostics in their employment region. The options were based on referral criteria in reviewed DDH referral guidelines.

Responders were instructed to use their readily available knowledge without seeking additional help. A maximum 30-minute response time was applied from the opening of the questionnaire to discourage obtaining external knowledge. The questionnaire consisted of 24 items on one page, including five adaptive questions. The format of the answers was free text, numerical and multiple-choice with single and multiple answer possibilities.

The end of the questionnaire prompted the responder to mark the questionnaire as complete or incomplete. A questionnaire was considered complete if marked as such by the respondent, regardless of any missing answers.

Variables

If there were discrepancies in the featured referral criteria between local and regional guidelines, the differing criteria were excluded from analysis for that region.

We defined knowledge in the context of referral criteria recognition as the respondent's ability to identify referral criteria used in their employment region and reject referral criteria not used in the respondent's employment region.

The answers were dichotomised as correct or incorrect. Answers were classified as correct if: 1) the referral criterion was checked in the survey and was featured in the responder's current regional DDH referral guidelines, or 2) the referral criterion was unchecked in the survey and not featured in the responder's current regional DDH referral guidelines.

Only questionnaires marked as completed by the responder were analysed.

Statistical methods

Answers given in the questionnaire underwent descriptive statistical and graphical analysis using STATA version 16.1 (StataCorp, College Station, TX, USA) and Microsoft Excel 2019 (Microsoft, Redmond, WA, USA).

To calculate correct answer percentages and statistical significance of these, while taking years of certification and annual number of DDH screenings into account, a generalised linear model with identity link and robust standard errors was fitted to the binary risk recognition variable with correct answers presented as percentages with 95% confidence intervals (CIs) while using breech position and the North Denmark region as references and adjusting for the profession of the responders. A p-value below 0.05 was considered significant.

Ethical considerations

Ethical approval was not required according to the guidelines of the Danish National Committee on Health Research Ethics for non-interventional studies.

The respondents were informed that the anonymised results of the survey would be published, and that they would be compared with each other on a regional level.

Trial registration: not relevant.

RESULTS

A total of 198 questionnaires were collected; eight were incomplete and 12 did not match the inclusion criteria, leaving 178 questionnaires to be included in this study. Through online databases, we collected 11 current local and regional DDH referral guidelines. Two local guidelines from the Central Denmark Region (Horsens and Viborg regional hospitals) differed from regional guidelines with regards to three risk factors used as referral criteria. These risk factors were excluded from analysis for the Central Denmark Region.

Among the 178 respondents, 97 were midwives, 58 GPs and 23 GPs in training. The regional distribution was 24 from the North Denmark Region, 54 from the Central Denmark Region, 36 from the Region of Southern Denmark, 25 from Region Zealand and 39 from the Capital Region of Denmark. The respondents' demographics are presented in **Table 1**.

TABLE 1 Demographics of included respondents.

	Profession		
	general practitioner (N = 58)	midwife (N = 97)	general practitioner in training (N = 23)
<i>Employer region, n</i>			
Capital Region of Denmark	12	23	4
Region Zealand	7	17	1
Region of Southern Denmark	9	19	8
Central Denmark Region	16	30	8
North Denmark Region	14	8	2
Time certified, median (IQR), yrs	5 (2-10.5)	5 (2-10)	-
<i>DDH screenings yearly, n</i>			
0-30	41	14	15
31-60	16	31	6
61-100	0	36	1
> 100	1	16	1

DDH = developmental dysplasia of the hip; IQR = interquartile range.

Six risk factors for DDH were identified across all guidelines, of which four were used in all Danish regions: breech presentation, oligohydramnios, family history of DDH and clubfeet. Regionally dependent risk factors for DDH were twins and prematurity (weight < 1,500 g). A summary of the guidelines is presented in **Figure 1**.

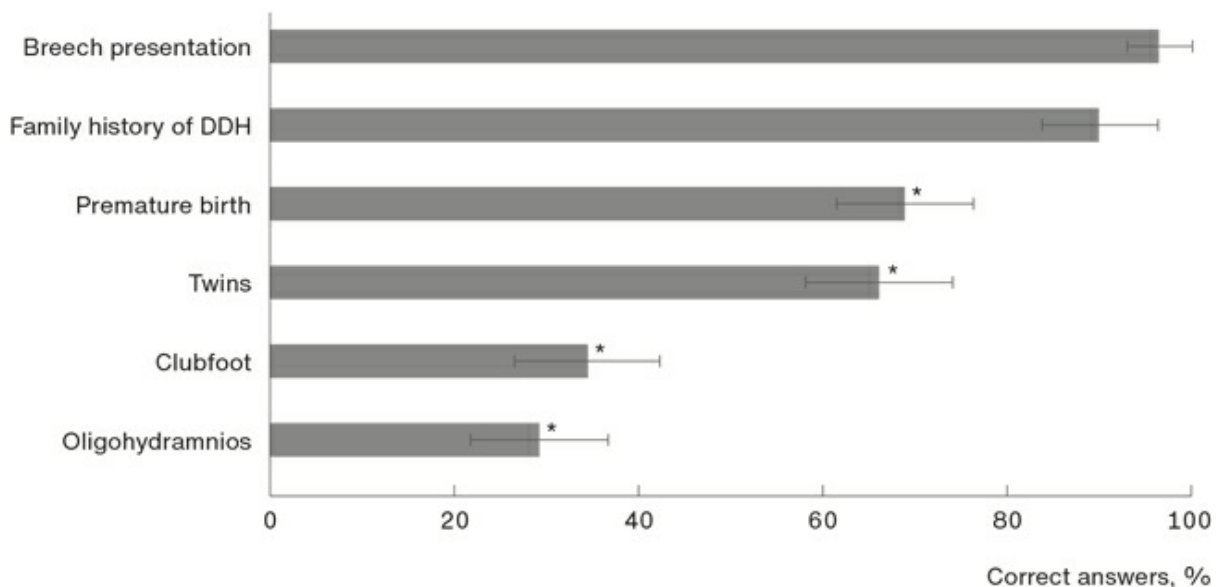
FIGURE 1 Summary of risk factors for developmental dysplasia of the hip (DDH) used as referral criteria for specialised ultrasound examination in the five Danish regions. Only local guidelines, which differed from the guidelines of their region, are featured.

Region/hospital	Breech presentation	Twins	Oligo-hydramnios	Family history of DDH	Clubfoot	Premature birth ^a
Capital Region of Denmark	x	x	x	x	x	
Region Zealand	x	x	x	x	x	x
Region of Southern Denmark	x		x	x	x	
Central Denmark Region	x	x	x	x	x	
Horsens Regional Hospital	x	x	x	x		
Viborg Regional Hospital	x			x	x	
North Denmark Region	x		x	x	x	

a) Birthweight < 1,500 g.

Overall, correct answer percentages of currently used risk factors for DDH in the respondent's region were highest for breech presentation (96%) and family history of DDH (90%). In descending order, the overall correct answers for risk factors were twins (66%), premature birth (63%), clubfoot (34%) and oligohydramnios (29%). No statistically significant difference was observed in the correct answer percentages between health professions or levels of experience (years of certification, annual number of DDH screenings). All correct answer percentages are summarised in **Figure 2**.

FIGURE 2 Bar chart presenting correct answer percentages for referral criteria recognition among respondents employed in the five Danish regions. Correct answer percentages are adjusted for regional differences in risk factors used, i.e. a checked answer in "Twins" is correct in the Capital Region of Denmark, the Region Zealand and the Central Denmark Region, but not in the North Denmark Region or the Region of Southern Denmark.



DDH = developmental dysplasia of the hip.

*) $p < 0.05$ with breech presentation as reference.

The correct answer percentages for breech presentation, family history of DDH, premature birth and twins differed from all other risk factors ($p < 0.05$). Correct answer percentages for clubfoot and oligohydramnios did not differ significantly from each other, but were lower than the correct answer percentages for all other risk factors ($p < 0.05$).

DISCUSSION

We found that six risk factors were used as DDH referral criteria in the Danish regions. All guidelines featured four risk DDH factors (breech position, family history of DDH, clubfoot and oligohydramnios). Breech position and family history of DDH had the highest overall correct answer percentages, whereas clubfeet and oligohydramnios had the lowest correct answer percentages.

The present study was limited by the anonymised survey as we were unable to confirm the respondents' professions, establish if they used their readily available knowledge only and ensure that they performed the survey once only. Further selection bias may affect the results as we did not perform a random selection of participants because responders participated on a volunteer basis, risking an unintentional selection of the most knowledgeable responders with regards to DDH. As a consequence, selection bias may potentially skew our results towards higher correct answer percentages, meaning that the actual recognition of risk factors among the background population may be even lower. Our study population consisted of 55% midwives, which is not an accurate representation of the background population of primary screeners.

However, we only advertised the survey on restricted social media groups and we failed to find a statistically significant difference in correct answer percentages between professions. This may be a type II error as the study was not powered to detect such a difference. Furthermore, as we did not know the number of active users in each social media group and were unable to assess the number of users who saw the invitation, the response rate is difficult to assess.

Overall, this study may have some limitations, but we expect the respondents to have followed the instructions provided, thus making their answers valid.

Many risk factors have been associated with DDH, but they have not all been proven to increase the risk of DDH. Six risk factors were featured in the Danish regional guidelines for DDH (breech position, family history of DDH, premature birth, twin birth, musculoskeletal syndromes, clubfoot and oligohydramnios). Among these risk factors, two were demonstrated to increase the risk of DDH (breech position and family history of DDH) [7, 8]. Among the remaining, three have not been proven to increase the risk of DDH (twin birth, premature birth and oligohydramnios) [9], and the risk of DDH in patients with clubfoot is controversial due to inconsistent findings [10, 11].

The numerous risk factors and inconsistent findings do not provide a clear picture of the role of risk factors in DDH screening, which is, to some extent, reflected in opinions of the expert community. In 2013, Roposch et al. conducted a survey of a group of 220 European paediatric orthopaedic surgeons and demonstrated poor agreement between experts in the rating of ten individual DDH risk factor and the importance of DDH risk factor screening in general [12].

Internationally, only breech presentation and a family history of DDH are featured in national screening programmes such as the recommendations from the British Newborn and Infant Physical Examination Screening Programme [13] and the American Academy of Orthopaedic Surgeons' guideline on DDH [14]. It is reassuring that the correct answer percentages for breech presentation and family history of DDH were ranked highest in the present study, whereas correct answer the percentages for non-proven or debated risk factors were lowest.

However, recognition of DDH referral criteria featured in local and regional guidelines was generally low (< 66%) for four of out of six criteria among primary screeners in the Danish selective DDH screening programme. This may, in part, be explained by the variations in referral guidelines between regions and local institutions.

The lack of knowledge along with the use of non-proven risk factors for DDH as referral criteria may lead to

unnecessary ultrasound examinations and false positive diagnoses, which are associated with unnecessary use of health resources and may cause worries among the new parents.

CONCLUSIONS

This study found inconsistencies among local and regional guidelines for the selective screening of DDH within the five geographical regions of Denmark. Recognition across regions of the risk factors used as referral criteria for DDH examination was high (> 90%) for breech presentation and family history of DDH, and medium to low (67-29%) for premature birth, twins, clubfeet and oligohydramnios.

These findings highlight a need for national standardisation of the DDH screening programme in Denmark including a revision of the risk factors used to sufficiently detect DDH along with standardised training of the health professionals referring patients suspected of DDH.

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