Advanced Journal of Nursing and Midwifery Research (AJNMR) ISSN: 7943-0783, Vol. 1(1), pp. 001-005, February, 2022. Available online at www.advancedscholarsjournals.org © Advanced Scholars Journals

Full length Research paper

Warm seafood preservation into extraordinarily experienced women is condensed in pregnancy: A lead study

***Dowager JK, Hibbeln TT and Wen ZM**

De partment of Food Science and Technology, Hungkuang University, No. 1018, Sec. 6, Taiwan Boulevard, Shalu District, Taichung City 43302, Taiwan (R.O.C.).

Accepted 20 January, 2022

Oily fish is a unique natural source of vitamin D and marine n3 fatty acids. The purpose of this study was to investigate where pregnant women receive nutritional advice and whether they eat seafood during pregnancy. A self-selected expedient sample of highly educated women (n = 43) answered a self-managed web-based questionnaire. Women reduced their intake of both lean (p <0.013) and oily (p <0.003) fish during pregnancy. This suggests that women are not fully aware of the beneficial effects of ingesting fish and shellfish during pregnancy..

Key words: Marine n-3 fatty acids, Pregnant woman, vitamin D, nutritional advice, omega-3 fatty acids, seafood.

INTRODUCTION

Seafood is a unique dietary source of the marine n-3 fatty acids, eicosapentaenoic acid (EPA, 20:5n-3) and docosahexanoic acid (DHA, 22:6n-3), vitamin D and B_{12}, and the trace minerals iodine and selenium (Dahl et al., 2006), and should be part of a healthy balanced diet (Fødevaredirektoratet, 2003; SACN/COT, 2004; EFSA, 2005; Norwegian Scientific Committee for Food Safety (VKM), 2007; Food and Nutrition Board and Committee on Nutrient Relationships in Seafood: Selections to Balance Benefits and Risks, 2006; Becker et al., 2007). Both lean and oily fish can improve the overall nutrient content of a diet (VKM, 2007). Eating a meal of lean fish provides more than the daily requirement of marine n-3 fatty acids, iodine and vitamin B_{12}, while a meal of oily fish provides 190, 900, and 1700% of daily requirement of vitamin D, vitamin B_{12}, and marine n-3 fatty acids, respectively. Women are recommended to continue their fish consumption during pregnancy (Koletzko et al., 2007; Oken et al., 2005). However, it is a question to what extent the pregnant mothers receive and admit this recommendation.

A diet consisting of a wide range of nutrients is important for mother's health during and after the pregnancy as well as for an optimal development of the foetus (Anderson, 2001). A high seafood intake in pregnancy has been shown to be associated with better infant cognition (Oken et al., 2005). Also, beneficial effects on child development were seen in children of mothers who exceeded the US Federal Government Agencies advice of >340 g seafood per week during pregnancy (Hibbeln et al., 2007). This advice is given to avoid foetal exposure to neurotoxins which may be present in seafood (VKM, 2007), since high mercury levels are associated with lower cognition (Oken et al., 2005). Maternal seafood intake of less than 340 g per week during pregnancy did not protect children from adverse neurodevelopmental outcomes, and Hibbeln et al. (2007) stated that with a weekly intake of > 340 g seafood, the intake of beneficial nutrients overweight the potential harm of exposure to contaminants.

Most women discover that they are pregnant around week 5, and Norwegian women are recommended to have the first maternity consultation between week 8 and 12. At this consultation, health care professionals give dietary advice, especially regarding folic acid, iron, vitamins A and D and alcohol. Cod liver oil is recommended as supplement, because of its high vitamin D and marine n-3 fatty acid content (SHdir, 2005). However, oily fish is a unique, natural source to both vitamin D and

*Corresponding author. Email: Dowager2000@gmail.com

marine n-3 fatty acids (Dahl et al., 2006; VKM, 2007), and the general Norwegian recommendation is to eat more fish for dinner and as spread (Directorate for Health and Social Affairs). At present, the seafood intake in fertile women is low as compared to the average population in Norway (Johansson and Solvoll, 1999; Meltzer et al., 2002).

There is a positive correlation between education and a healthy diet, and we wanted to investigate seafood consumption during pregnancy in women with a high level of education working within seafood research and fishery management. We also want to know from where pregnant women get dietary advices regarding omega-3, vitamin D and folic acid.

MATERIALS AND METHODS

This pilot study used a cross-sectional design to assess seafood intake during pregnancy in a self selected convenience sample. Women were recruited by e-mail or information published at the intranet web page addressing all students and employees at the Building for Basic Biological Research and Department of Biology, both at the University of Bergen; the Directorate of Fisheries, Bergen; the Ministry of Fisheries and Coastal Affairs, Oslo; the Institute of Marine Research, Bergen; and the National Institute of Nutrition and Seafood Research, Bergen. The e-mail/intranet web- page contained information regarding the study and a link and password to a web page containing a self-administered questionnaire. A reminder was sent by e-mail or posted at the intranet web pages two weeks after the first invitation. To meet inclusion criteria, the woman had to be pregnant in third trimester or have a child born within the last 24 months. Informed consent was obtained from all participants.

The questionnaire was designed to address whether the women consumed at least one portion of seafood per week, and she was asked to confirm seafood intake for each of the following periods; before pregnancy, before week 12, during week 12 to18, during week 18 to 24, and after week 24, or do not eat at all. Seafood was categorised as oily fish (e.g. salmon, halibut, mackerel, and herring), lean fish (e.g. cod, saithe, and shellfish), and seafood as spread (e.g. shrimps, sardines, and pickled herring). Questions about supplementation (cod liver oil, omega-3 fatty acids, vitamin D, and folic acid) were divided into the same periods as seafood intake. No questions regarding weekly frequency were included. The questionnaire also asked from where (medical doctor, midwife, books/magazines, others or not received information) the women got dietary advices regarding cod liver oil, omega-3 fatty acids, vitamin D, and folic acid related to pregnancy. Information about age, education, pregnancy week, number of children, and age of last born child was also gathered.

Folic acid was included as a reference since there has been an extensive campaign in Norway focusing on the importance of folic acid before gestation and during the first 12 weeks of pregnancy to avoid neural tube defects. No questions tracking morning sickness was included.

The study protocol was in accordance with the requirements of the Privacy Ombudsman for Research at the Norwegian Social Science Data Services (NSD). Anonymity was safeguarded by anonymously answering a self-administered questionnaire and the results are not presented per workplace.

All data were analyzed using Statistical Package for the Social

RESULTS AND DISCUSSION

In recent years, there have been several press releases regarding health risks associated with seafood intake. Some countries have restrictions regarding seafood intake for pregnant women that are in contrast to several scientific reports on risk-benefit, concluding that seafood is part of a balanced diet due to its beneficial effects on foetus, the growing child, and the mother (Denmark (Fødevaredirektoratet, 2003), UK (SACN/COT, 2004), EFSA (EFSA, 2005), Norway (VKM, 2007), US (Food and Nutrition Board and Committee on Nutrient Relationships in Seafood: Selections to Balance Benefits and Risks, 2006), and Sweden (Becker et al., 2007)). Including marine n-3 fatty acids during pregnancy and lactation, have been shown to increase the levels of DHA in infants, associated with positive impact on the child's mental development later in life (Helland et al., 2006; Helland et al., 2003). A high intake of seafood (> 340 g/week) during pregnancy has been associated with higher verbal IQ (Hibbeln et al., 2007). In the present study we recruited highly educated women (Table 1) at work places focusing on seafood research and fishery management. We expected to have a higher seafood intake than fertile women in general, which in Norway is less than half a meal of oily fish a week for women in childbearing age (VKM, 2007; Meltzer et al., 2002). These results showed, on the contrary, that nearly half of the women reported that they never ate oily or lean fish (Figure 1). Despite the fact that the majority of the women knew that seafood is a good dietary source of the marine n-3 fatty acids (94%) and vitamin D (79%), they significantly decreased intake of oily fish ($p < 0.003$) and lean fish ($p < 0.013$), and there was a tendency to decreased intake of seafood as spread ($p < 0.065$) during pregnancy (Figure 1). The majority (83%) did not eat seafood as spread, and nearly half of the women did not eat oily fish (47%), or lean fish (38%) at all during the pregnancy. The general Norwegian recommendation, supported by a number of scientific reports on risk assessment of seafood consumption (Fødevaredirektoratet, 2003; SACN/COT, 2004; VKM, 2007; Becker et al., 2007) is to eat more fish, both as dinner and as spread, and pregnant women are

Table 1. Age, education and maternal status of the women (n = 43).

Candidate	Category	Number
Age	20 - 25	1
	26 - 30	14
	31 - 35	23
	≥ 36	5
Education (University)	1 - 3 years	1
	4 - 6 years	20
	> 6 years	26
Currently pregnant	Yes	13
	No	30

A total of 47 women were recruited, of which 4 were excluded due to pregnancy in first or second trimester.

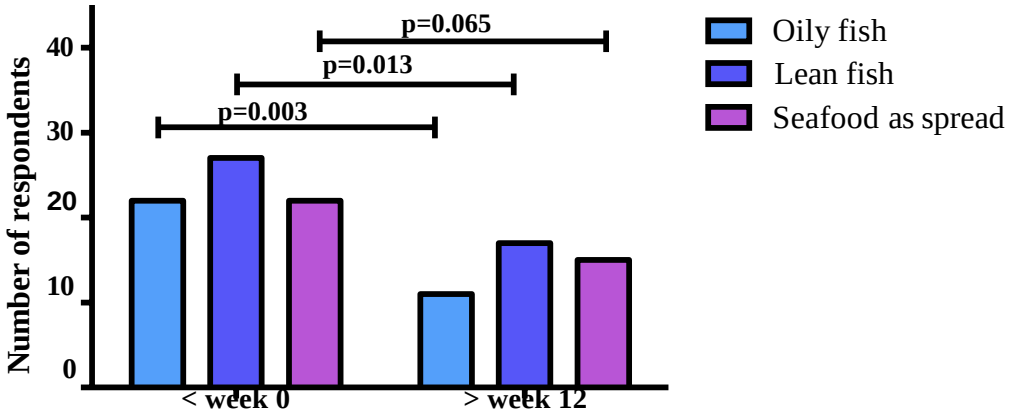

Figure 1. Percentage of women (n = 43) reporting seafood intake before pregnancy (< week 0) and after 12 weeks of pregnancy (> week 12). The women were asked if they ate oily fish, lean fish or seafood as spread at least once a week.

also included in the target group for this recommendation (VKM, 2007).

We expected our participants to be more familiar with the health advantages of seafood intake during preg- nancy due to their selected work places (Fishery Management or Research Institutes related to fish and other seafood). Most of the participating women knew that fish is a good source of vitamin D (79%) and the marine n-3 fatty acids (94%), but less knew that seafood is also a good source of iodine (60%) and selenium (40%). However, the women were probably not fully aware of the positive health effects of marine n-3 fatty acids and vitamin D during pregnancy, since so many of them did not eat oily fish (47%) or took marine n-3 fatty acids supplements at least three times a week when pregnant (62%). The fear of heavy metals and other toxins is a probable cause for the observed reduction in fish intake since more than 60% of the women reported an increased focus on seafood intake during pregnancy. Morning sickness could also cause women to reduce seafood intake during pregnancy, and the interpretation of the results is partly limited since morning sickness was not tracked in the present study. However, morning sickness seldom last for the entire pregnancy. A Canadian study (Lacroix et al., 2000) showed that pregnancy nausea lasted for 34.6 days (mean value), and 50% were relieved by 14 weeks' gestation, while 90% had relief by week 22. In our study, we did not observe any difference in seafood intake during the first, second or third trimester, indicating that temporarily morning sickness was at least not the main cause of the observed reduction in seafood intake. A significant inverse relationship between education and pregnancy nausea has been reported, where women with low educational level, middle to low income, and part-time worker had the highest degree of nausea and vomiting during pregnancy (Lacroix et al., 2000). A positive correlation has been shown between education and a healthy diet. In this study, all, but one participant, had > 4 years of higher education (University/University college), and 55% had > 6 years of higher education. We

found that the selected group of highly educated women had a general interest in their diet and reported an increased focus on nutrition during pregnancy both generally (96%) and with respect to seafood (66%). Our findings are in accordance with preliminary results from the Norwegian Mother and Child Cohort Study where nearly 3 out of 4 mothers report dietary changes in pregnancy (www.fhi.no).

Nearly half of the women in this study did not receive information regarding vitamin D, fish oil or marine n-3 fatty acids supplements from health personnel (Figure 2). Guidelines for maternity care recommend health care professionals to inform pregnant women about folic acid, iron, vitamin D and cod liver oil (SHdir, 2005). An extensive information campaign started in Norway in 1997, addressing women planning to become pregnant to be informed about the importance of folic acid during pregnancy. Despite the massive campaign, only 58% of the women in this study took folic acid before pregnancy or in the first trimester. This is in accordance with other reports evaluating the campaign (Staff et al., 2005), and can partly be explained by the first maternity consultation normally being around week 8 of pregnancy. Most participants in this study (83%) were interested in dietary advices early in pregnancy. Consumers trust professional such as physicians, nutritionists, and scientists when it comes to dietary advices (www.seafoodplus.org). Pregnant women rely on physicians and midwifes for balanced dietary guidance. Hence, pregnant women should be offered a maternity consultation as early as possible in pregnancy. This should take place as soon as the woman discovers her pregnancy and the first consultation should have a strong focus on nutrition.

Because of small sample size (n = 43), the findings from this study should be viewed cautiously. By using a self-selected convenience sample, the women in this study are not representative of women in childbearing age in Norway. The relative homogeneity of this study population, all having high level of education and most working within seafood management or seafood research is a limitation to the interpretation of the results. The questionnaire was not validated; and we cannot say if the women had a nutritional status reflecting their diet.

We had a cut off at 24 months since last birth, but when responding retrospectively, it may be difficult to recall correctly. However, we experienced that pregnant women are very conscious of what they eat, due to a number of dietary advices on what to include and exclude when pregnant. We therefore assume they were able to recall their general seafood intake in this particular period. Information regarding why the intake was reduced in the present study, such as morning sickness or fear of heavy metals and toxins, were not addressed since the reduction in seafood intake was unexpected.

A healthy and balanced diet is important for a mother's health during and after the pregnancy as well as for an optimal development of the foetus and infant. Health care professionals play an important role in providing dietary advice to pregnant women. A thorough nutritional focus on the first maternity consultation early in pregnancy, has the potential of improving the mothers' nutritional status, and thereby, both the mothers' health and the children's health and development.

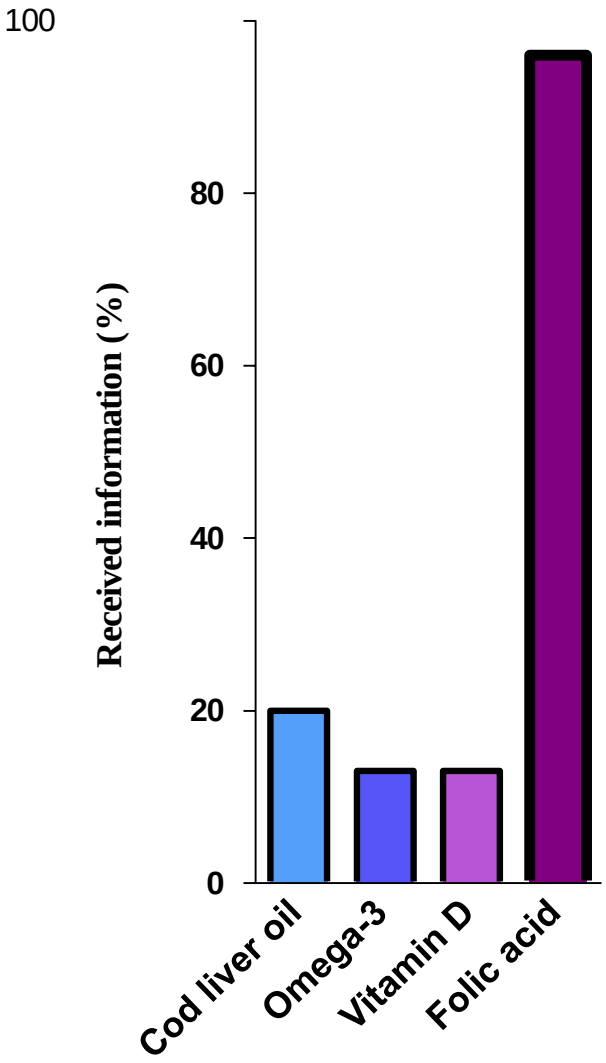

Figure 2. Percentage of women (n = 43) getting nutritional information regarding cod liver oil, marine n-3 fatty acids, vitamin D and folic acid from health care professionals during pregnancy consultations.

In the present study, we observed that women, who normally ate fish at least once a week, decreased their fish intake during pregnancy. This is an unexpected finding considering the high age, high level of education and the fact that most participants worked within seafood related institutes. Since physicians and midwifes play an important role regarding dietary guidance to pregnant women, it is important that health care professionals focus on the importance of a healthy and balanced diet, and the beneficial effects of including fish and marine n-3 fatty acid supplements in the diet before, during and after the pregnancy.

ACKNOWLEDGEMENTS

Johanna Lampe is gratefully acknowledged for technical assistance with the web based questionnaire. We thank Håvard Berntsen for valuable comments. All authors have participated in planning, implementation and writing. The study was financed by the National Institute of Nutrition and Seafood Research (NIFES).

REFERENCES

Dahl L, Bjørkkjaer T, Graff I,E Malde MK, Klementsen B (2006). Fish -- more than just omega-3. Tidssk Nor Laegeforen 126(3):309-311.

Fødevaredirektoratet (2003). Helhedssyn på fisk og fiskevarer (in Danish) (Holistic view of fish and fish products). Søborg, Denmark: Fødevaredirektoratet. pp. 137.

SACN/COT (2004). Advice on fish consumption: benefits & risks. SACN (Scientific Advisory Committee on Nutrition) and COT (Committee on Toxicity) joint report; London: TSO.

EFSA (2005). Opinion of the Scientific Panel on Contaminants in the Food Chain on a request from the European Parliament related the Safety Assessment of Wild and Farmed fish. EFSA J. 236:1-118.

Norwegian Scientific Committee for Food Safety, VKM (2007). A comprehensive assessment of fish and other seafood in the Norwegian diet. Norwegian Scientific Committee for Food Safety. Oslo, Norway. pp. 174.

Food and Nutrition Board and Committee on Nutrient Relationships in Seafood: Selections to Balance Benefits and Risks (2006). Seafood choices - Balancing benefits and risks. The National Academic Press, Washington DC, US, WD The National Academic Press, US.

Becker W, Darnerud P, Petersson-Grawé K (2007). Fish Consumption - Risks and benefits (in Swedish). Livsmedelverket, Uppsala, Sweden. pp. 37.

Koletzko B, Cetin I, Brenna J (2007). Consensus statement: Dietary fat intakes for pregnant and lactation women. Br. J. Nutr. 98:873-877.

Oken E, Wright R, Kleinman K, Bellinger D, Amarasiriwardena C, Hu H, Rich-Edwards J, Gillman M (2005). Maternal Fish Consumption, Hair Mercury, and Infant Cognition in a U.S. Cohort. Environ. Health. Perspect. 113(10):1376-1380.

Anderson A (2001). Symposium on "Nutritional adaptation to pregnancy and lactation". Pregnancy as time for dietary change? Proc. Nutr. Soc. 60:497-504.

Hibbeln J, Davis J, Steer C, Emmett P, Rogers I, Williams C, Golding J (2007). Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): an observational cohort study. Lancet 369(9561):578-585.

SHdir (2005). Retningslinjer for svangerskapsomsorgen (Guidelines for maternity care, in Norwegian). Oslo, Norway: Sosial- og helsedirektoratet (Trykksakekspedisjonen).

Johansson L and Solvoll K (1999). Norkost 1997 (In Norwegian). Landsomfattende kostholdsundersøkelse blant menn og kvinner i alderen 16-79 år (Country-wide dietary survey among men and women aged 16-79 years). Statens råd for ernæring og fysisk aktivitet, Oslo, Norway.

Meltzer H, Bergsten C, Stigum H (2002). Fisk- og viltundersøkelsen -- konsum av matvarer som kan ha betydning for inntaket av kvikksølv, kadmium og PCB/dioksin i norsk kosthold (Fish and Wildlife survey - the consumption of foods that may affect the intake of mercury, cadmium and PCB / dioxin in the Norwegian diet). Oslo, Norway: SNT, Statens næringsmiddeltilsyn. pp. 166.

Helland I, Saugstad O, Saarem K, Van Houwelingen A, Nylander G, Drevon C (2006). Supplementation of n-3 fatty acids during pregnancy and lactation reduces maternal plasma lipid levels and provides DHA to the infants. J. Matern. Fetal Neonatal Med. 19(7):397-406.

Helland I, Smith L, Saarem K, Saugstad O, Drevon C (2003). Maternal supplementation with very-long-chain n-3 fatty acids during pregnancy and lactation augments children's IQ at 4 years of age. Pediatrics 111(1):e39-44.

Lacroix R, Eason E, Melzack R (2000). Nausea and vomiting during pregnancy: A prospective study of its frequency, intensity, and patterns of change. Am. J. Obstet. Gynecol. 182(4):931-937.

Staff A, Løken E, Holven K, Sygnestveit K, Vollset S, Smeland S (2005). Effekt av offentlige tiltak for å forebygge nevralrørsdefekter med folat (Effect of public measures to prevent neural tube defects with folic acid). Tidssk Nor Laegeforen 125(4):435-437.