IRON STATUS AND FACTORS INFLUENCING IRON STATUS OF SOLOMON ISLANDS WOMEN LIVING IN NEW ZEALAND

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Abstract

Iron deficiency is a global problem among women of reproductive age, particularly in developing countries. A recent survey from the Solomon Islands reported that 44% of women of reproductive aged were anaemic. Currently nothing is known about the iron status of women from the Solomon Islands living in New Zealand (NZ).

Aim:

This study aims to assess and compare iron status and factors influencing iron status of Solomon Islands with Caucasian women living in and around Auckland, NZ.

Methods:

This was a cross-sectional study comparing 40 Solomon Islands women with 80 age-matched Caucasian women living in and around Auckland. Serum ferritin (SF), C-reactive protein (CRP) and haemoglobin (Hb) were analyzed. Iron status was defined as: iron replete (SF > 20 µg/L + Hb > 120 g/L), iron deficiency (ID) (SF < 20 µg/L + Hb > 120 g/L) and iron deficiency anaemia (IDA) (SF < 20 µg/L + Hb < 120 g/L). Participants with CRP >10 mg/L were excluded from this study. Dietary assessment was conducted using a computerised iron food frequency questionnaire including questions on dietary habits, purposely to assess foods affecting iron status. In addition, a 24-hour dietary recall was used to assess the average daily nutrient intake of Solomon Islands women. Demographic and body composition data were also collected together with data on other factors affecting iron status such as blood loss and general health history.

Results:

No significant difference in the prevalence of low iron stores + IDA was found in Solomon Islands and Caucasian women (17 *vs.* 23%, p=0.478). The frequency of red meat, prepared meat and offal, and all white meat consumption did not differ between the two groups (p=0.187). There was a significant difference in fish/seafood consumption (p=0.001), Solomon Islands women consumed fish/seafood more frequently than Caucasian women. Solomon Islands women also consumed medium-high vitamin C fruits more frequently (p=0.002) and dairy products less frequently (p=0.001) than Caucasian women. No significant difference (p=0.872) was identified in the frequency of intake of beverages

containing polyphenol between the two groups. But the analysis of individual beverages showed that Solomon Islands women more frequently consumed black tea compared to Caucasian women, the similar practice was identified from the dietary habit assessment where 40% of Solomon Islands women drank black tea an hour before or after evening meals. Fewer Solomon Islands women consumed multivitamins/minerals than Caucasian women (12.8% vs. 66.7% respectively) and none of the Solomon Islands women reported taking dietary supplements compared to 44% Caucasian women. In regards to menstrual blood loss, although there was no significant difference between the two groups in overall menstrual blood loss units, Caucasian women reported on average 1 day longer menstrual period than Solomon Islands women. A small number of women in each group had previously donated blood, but in every case it had taken place more than 6 months prior to this study. Contraceptive use was significantly lower among Solomon Islands women compared to Caucasian women (p=0.001). Body mass index and waist circumferences were significantly higher (p=0.001 and p=0.001 respectively) in the Solomon Islands women compared to the Caucasian women.

Conclusion:

The iron status of Solomon Islands and Caucasian women did not differ, but there was variability between groups in the intake of foods and behaviours that are known to influence iron status. This study found both protective and non-protective factors for ID among Solomon Islands women, although the correlation of those factors with iron status were not able to be assessed due to a relatively small sample size and low prevalence of ID/IDA. This study therefore concludes that ID was not a concern for Solomon Islands women living in NZ, and that the prevalence was lower in this group than in women living in the Solomon Islands. This is possibly the result of adapting to different dietary habits and behaviours, increased accessibility to animal sources of iron, and high intakes of vitamin C-rich foods in their host country.

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Research team

The research reported in this thesis was planned and executed by a team of researchers. The contribution of each team member is described in the table below.

Rosemary Kafa	Study proposal, ethics application, development of study protocols, participant recruitment, data collection, data processing, statistical analysis and thesis writing
Dr. Cath Conlon (Main supervisor)	Supervised and assisted with study proposal, ethics application, development of questionnaires, development of study protocols, data collection, blood processing, supervised and review of the final thesis
Dr. Rozanne Kruger (Co-supervisor)	Supervised and assisted with study proposal, ethics application, development of study protocols, development of questionnaires, training in dietary assessment, data collection, dietary data analysis, supervised and review of the final thesis
Associate Professor Welma Stonehouse (Co-supervisor)	Supervised and assisted with study proposal, ethics application, data collection, blood processing, data processing, statistical analysis, supervised and review of the final thesis.
Simon Bennett	Phlebotomist
Avril Balmer	Phlebotomist
Carlos Miranda	Blood processing
Regina Wypch	Assistance with body composition measurements
Cheryl Gammon	Assistance with statistical data analysis
Kathryn Beck	Compilation of Caucasian women's databases and assistance with calculation of menstrual blood loss
Michelle Ingram	Language editing

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Abbreviations

Abs	Absorbency
AGP	α_1 – acid glycoprotein
AHA	American Heart Association
AMDR	Acceptable macronutrient distribution range
ASIWA	Aotearoa Solomon Islands wantoks' association
APPs	Acute phase proteins
BLU	Blood loss unit
BMI	Body mass index
CIHAT	Computerised iron habits assessment tool
Cm	Centrimetre
CO_2	Carbon dioxide
CRP	C – reactive protein
D_1	Dopamine receptor 1
D_2	Dopamine receptor 2
DA	Dopamine
DALYs	Disability adjusted life years
Dcytb	Duodenal cytochrome b
DHS	Demographic health survey
DMT1	Divalent metal transporter 1
DNA	Deoxyribonucleic acid
$FADH_2$	Flavin Adenine Dinucleotide
FeFFQ	Iron food frequency questionnaire
Fe^{2+}	Iron ferrous
Fe^{3+}	Iron ferric
FPN	Ferroportin
g	gram
GABA	γ aminobutyric acid
GAD	Glutamate decarboxylase
GBD	Global burden of disease

GDP	Gross domestic product
Hb	Haemoglobin
HCP1	Haem carrier protein 1
HD	Number of ‘heavy’ days during an average period
HP	Number of pads on a ‘heavy’ day
HT	Number of tampons on a ‘heavy’ day
Ht	Height
5-HT	5-Hydroxytryptophan
IANZ	International Accreditation New Zealand
ID	Iron deficiency
IDA	Iron deficiency anaemia
IDE	Iron deficiency erythropoiesis
IREs	Iron responsive elements
IRPs	Iron regulatory proteins
ISAK	International society for the Advancement of Kin anthropometry
IUD	Intrauterine device
IUD	Intrauterine foetal demise
Kcal	Kilocalorie
Kg	Kilogram
KiWI	Kiwi women iron study
KJ	Kilo joule
L	Litre
LBW	Low birth weight
LD	Number of ‘light’ days during an average period
LP	Number of pads on a ‘light’ day
LT	Number of tampons on a ‘light’ days
NA	Not assessed
NM	Not measured
m^2	Metre square
MCV	Mean cell volume
mg	Milligram
µg	Microgram

MID	Mild iron deficiency
MoHNZ	Ministry of Health New Zealand
MoHSI	Ministry of Health Solomon Islands
MUFA	Mono unsaturated fatty acids
NADH	Nicotinamide adenine dinucleotide plus Hydrogen
NNS	National nutrition survey
NZ	New Zealand
NZ NCEA L3	New Zealand national education achievement level 3
O_2	Oxygen
p	Probability
PKU	Phenylketonuria
PI	Pacific Islands
PUFA	Poly unsaturated fatty acids
RDI	Recommended daily intake
SD	Standard deviation
SDT	Suggested dietary target
SF	Serum ferritin
SFA	Saturated fatty acids
SI	Solomon Islands
SLS	Sodium lauryl sulphate –Hb
SOP	Standard operation protocols
SPC	Secretariat of the Pacific community
SPSS	Statistical package for social science
TBI	Transferrin bound iron
TfR1	Transferrin receptor 1
UK	United Kingdom
UN	United Nations
UNDP	United Nations development programme
UNICEF	United Nations international children’s fund
US	United States
USA	United State of America
WHO	World health organization

WISE	Women iron status and education
Wt	Weight