ASSOCIATIONS BETWEEN VITAMIN D-RELATED FACTORS (DIETARY, SUPPLEMENT USAGE AND SUN EXPOSURE LEVEL) AND HAEMOGLOBIN CONCENTRATION AMONG FEMALE STUDENTS IN UNIVERSITI PUTRA MALAYSIA

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UNDERGRADUATE

INTRODUCTION

- Anaemia is a common blood disorder, defined as a low blood haemoglobin (Hb) concentration than normal, and insufficient to meet an individual physiological need [1].
- In Malaysia, 1 in 5 Malaysians adults were anaemic, which corresponds to approximately 4.6 million of the population [3].
- The overall country prevalence of anaemia in 2019 was 21.3% and nearly 15.9% of women in reproductive age were diagnosed with mild anaemia [3].
- Rapid growth, hormonal changes and the onset of menstruation in females, have been identified as major contributors to anaemia throughout adolescence [2].
- Evidence showed that lack in dietary intake of iron, folate, or vitamin also contributed to anaemia [5].
- Deficiency of vitamin D has been shown to lead to an increased risk of anaemia, as it may cause the upregulation of hepcidin which would inhibits iron uptake from the gut [4]
- There is lack of anaemia studies associate with the vitamin D-related factors (diet, supplement and sun exposure level) especially among women of reproductive age in Malaysia.

OBJECTIVE

- To determine the associations between vitamin D-related factors (dietary, supplement usage and sun exposure level) and haemoglobin concentration among female students in Universiti Putra Malaysia (UPM)

METHODOLOGY

- Study Design: Cross-sectional
- Sampling Method: Convenient sampling
- Respondent: 155 female students from UPM
- Duration: March to April 2021 (MCO)

Table 1: Inclusion and exclusion criteria

Inclusion Criteria	• Malaysia • Female • Age 18-49 years old
Exclusion Criteria	• Pregnant women & lactating mothers • Presence of celiac disease, GERD, DM and metabolic disorders • Donated blood (past 6 months) • Having heavy bleeding blood loss due to menstrual cycle

Table 2: Instruments used in the study

Instrument	Interpretation
Self- administered questionnaire	Socio-demographic characteristics
SECA portable stadiometer & Digital weighing scale	To measure height and weight BMI classification [WHO, 2000] • Underweight (BMI <18.5 kg/m²) • Normal (BMI 18.5-24.9 kg/m²) • Overweight (BMI 25.0-29.9 kg/m²) • Obesity (BMI 30.0-40.0 kg/m²)
Hemocue Hb 201+ Analyzer	To measure Hb concentration [WHO,2001] • Non-anemia (Hb > 12.0 g/dL) • Mild anemia (Hb 11.0 – 11.9 g/dL) • Moderate anemia (Hb 8.0 – 10.9 g/dL) • Severe anemia (Hb< 8.0 g/dL)
Vitamin D Food Frequency and Lifestyle Questionnaire (FFLQ) [6]	To measure dietary and supplementary of vitamin D • RNI (2017) (15 µg/day – vitamin D)
Sun Exposure Index Questionnaire [7]	To measure sun exposure level (SEL) UV Index cut off [WHO,2002] • Low (UV <2) • Moderate (UV 3-5) • High (UV 6-7) • Very high (8-10) • Extreme (11+)
IBM Statistical Package for Social Sciences (SPSS) 25.0	• Descriptive (means ± SD) • Pearson Product Moment Correlation (test association at p < 0.05)

Chart 1: Flowchart of study protocol

Approval from JKEUPM and higher authorities of KPZ, K10 and K17 college

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Identified participants based on inclusion and exclusion criteria

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The participants followed SOP during the day of data collection

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Administration of socio-demo, vit D FFLQ & sun exposure level questionnaire

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Anthropometric measurement

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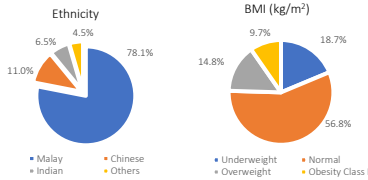
Hb concentration assessment

RESULTS & DISCUSSION

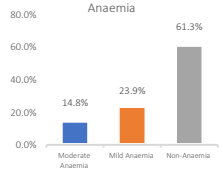
A. Socio-demographic and Anthropometric Measurements

Mean ± SD Age= 22.40 ± 1.34 years; BMI= 22.6 ± 4.7 kg/m²



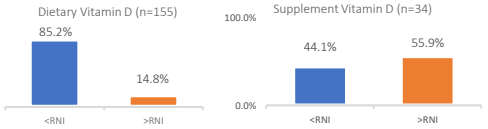
B. Haemoglobin Concentration

Mean ± SD: Hb Concentration = 12.10 ± 1.38 g/dL

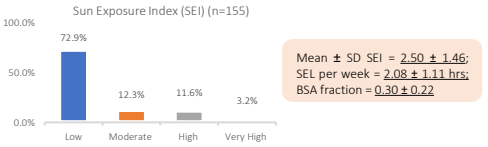


Prevalence of anaemia: 38.7%; slightly higher compared to WHO data with 30.1% of Malaysian adult [8] and other studies carried out among female university students with 35.5% [9], 34.75% [10] and 20.9% [11] of anaemia prevalence.

C. Vitamin D-Related Factors (Dietary and Supplement Usage and Sun exposure Level)



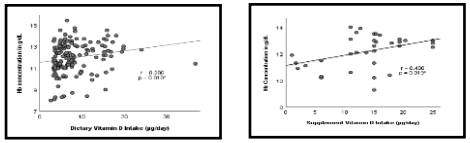
Mean ± SD Dietary Vit D = 8.10 ± 5.08 µg/day; Supp Vit D = 13.56 ± 6.38 µg/day



Mean ± SD SEI = 2.50 ± 1.46; SEL per week = 2.08 ± 1.11 hrs; BSA fraction = 0.30 ± 0.22

- The majority of participants unable to meet Malaysia's RNI for dietary and supplement vitamin D intake with low SEL
- Despite Malaysia considered as to have tropical climate, earlier studies in Asia have revealed a wide range of vitamin D deficiency prevalence [12,15].
- This could be due to participants spending most of their time outside in the shade and using sunscreen. UVB intensity can be reduced by up to 50% in some shady environments [13].

. Vitamin D-Related Factors (Diet, Supplement Usage and Sun Exposure Level)



* Correlation is significant at the 0.05 level (2-tailed)

- Low significant association between dietary vitamin D (r= 0.280, *p*=0.010) with Hb concentration.
- Moderate significant associate of supplement vitamin D (r= 0.191, *p*=0.017) with Hb concentration.
- No significant associations found between hours SEL, BSA fraction and SEI with Hb concentration (r= 0.098, *p*=0.227; r= 0.063, *p*=0.433; r=0.009, *p*=0.912).
- No significant association could be due to less body surface area exposed to sunlight. Most of participants was Malay female, as studies have linked increased rates of vitamin D deficiency in girls wearing clothes with a hijab cover [14].
- Duration to sun exposure was not associate could be due to sun protection behavior as most of our participants were sunscreen when going outside [12].

CONCLUSIONS

- In conclusion, this study demonstrates that increased in dietary and supplements vitamin D consumption led to improved Hb concentration
- Even though SEL might not have substantial impact on Hb concentration in current study due to low SEL and SEI, however, further investigations is needed to address the SEL factors which potentially has enhancer effect of iron status.

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