

The Attenuation of Dysmenorrhea and Menorrhagia by the Red Seaweed *Kappaphycus alvarezii*: A Pilot Study

Leanne M Sterling; J Hugh Butler July 2021

Background

Menstruation is a natural and necessary process of inflammation, ischemia, and wound healing . [1-4] The domains of menstruation, pain, flow, cycle length and chronicity are indicators of proper functioning of the reproductive organs and the signalling within the hypothalamic- pituitary-gonadal axis. Disorders of menstruation such as dysmenorrhoea and menorrhagia are increasingly linked to reproductive, obstetric and metabolic pathologies; such that the menstrual cycle now stands as a barometer for future health status in women and their offspring.

Menstrual disorders are highly prevalent with headline rates claiming over 95% of women experience menstrual problems at some time during their reproductive lives.[5, 6] The implications of such large numbers translate to enormous economic cost, with lost work and educational opportunities for women.[7, 8] Plus the health care burden, quality of life and other social and personal costs to the individual. The chronic, cyclic nature of menstrual abnormalities and the recognition of the burden to both the individual and society has led to a major drive towards action on women's menstrual health . [7]

The notion of "treatment" in menstrual contexts is a complex mix of cultural taboos, dismissive attitudes from frontline practitioners, and a "one size fits all" approach to prescribing. [9, 10] The front line treatment is over the counter analgesia, mostly NSAIDS such as ibuprofen, and although

effective in some, there are dangers from long term use plus a distinct cohort of women who remain resistant to NSAIDS.[11-13] The second line is progesterone based contraception, creating anovulation, and interrupting the normal menstrual cycle. [11, 13, 14] Other treatments range from complementary or behavioral therapies to medical interventions such as uterine nerve ablation or hysterectomy. [15] There is a need for safe, evidenced based treatments for menstrual abnormalities that allow normal menstruation to continue during treatment. In this space functional foods offer a safe, evidenced based alternative for women.

Studies into functional foods have examined the potential for seaweeds in the treatment of obesity, metabolic syndrome, and chronic inflammatory disorders. [16, 17] Menstruation is considered an inflammatory process, and overproduction of inflammatory markers play a role in disorders of menstruation especially dysmenorrhoea and menorrhagia.[2] However, seaweed not only has anti-inflammatory potential [18] but also reduces serum oestrogens [19-22] and normalizes menstrual symptoms [23]. It also shows promise in long term female health particularly in breast cancers. [24, 25]. [26]

In 2019 our functional foods company Biosea Health reported improvement in menstrual disorders among female customers. The literature on the role of seaweed in menstruation was sparse and no large cohort studies had been completed to our knowledge, As such, we designed and conducted this trial among young women within a single workplace in the Philippines.

Study Design

The study was a survey-based repeated-measures design without control or placebo. Participant pre-treatment measure acted as baseline measure for comparison.

Participants completed an initial survey then subsequent surveys at one, two and three months after taking seaweed. Pain (as measured through a visual analogue scale), cycle length and heaviness of bleeding (subjective measure) was assessed. The survey also captured concomitant, general health and demographic data.

Seaweed was supplied free of charge by Marine Algae Pty Ltd. The seaweed product is dried

Kappaphycus alvarezii grown in Davao, the Philippines, that is then placed into gel capsules. Dosage is 4 x 800mg capsules (approximately 2.5 grams of dried seaweed) per day.

Women aged 18-45 were recruited from a Davao Call Centre and their friends. Exclusion criteria included seafood allergies, menopause, hysterectomy and pregnancy. The survey was presented on an online platform (Survey Monkey). Statistical analysis was conducted using SPSS.

Results

Pain and Bleeding

Eighty-one participants completed the pain component of the survey, while 71 completed the bleeding component.

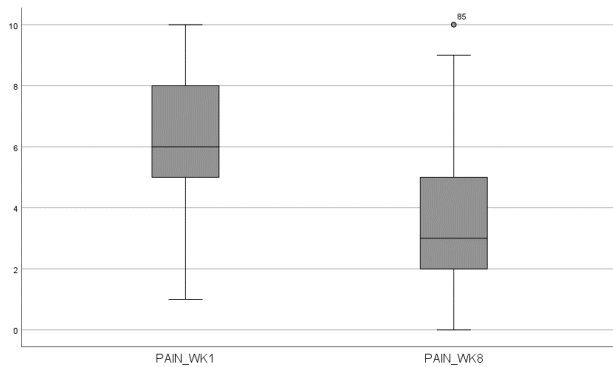


Figure 1. Menstrual pain before seaweed and 8 weeks after seaweed consumption.

Mean pain at the start was 6.44 (SE 0.25) and at period 2 (week 8) was 3.35 (SE 0.31). Pain significantly decreased ($t(65)=10.29$, $p<.000$, Cohen's $d = 1.59$). Seventy-one participants reported bleeding data at start and at 8 weeks. Mean bleeding days reduced from 4.5(SE 0.13) to 3.9(SE 0.17) which was significant ($p<0.001$).

Similarly participants reported heaviest bleeding occurred only on the first day of menses rather than for the first three days.

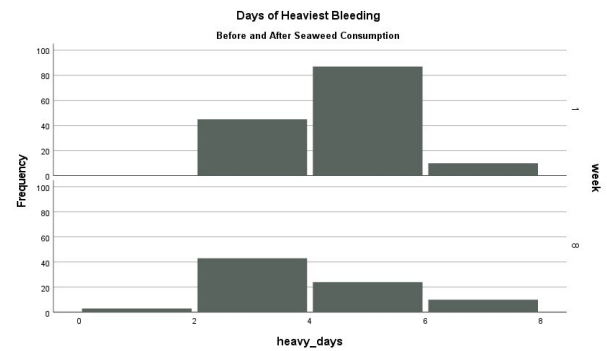


Figure 2. Days of bleeding before seaweed and 8 weeks after seaweed consumption.

There was a group of 8 women for whom seaweed was ineffective. A history of Polycystic Ovary Syndrome was noted by 5 women in the treatment resistant group. The severity of pain and bleeding was very high (9-10 on VAS) and consistent across the trial. Given endometriosis occurs in about 11% of the population and takes approximately 9 years for diagnosis[27], of the population, this treatment resistant group may have undiagnosed endometriosis

Side Effects

One participant reported a rash after one week and was advised to stop treatment. Gastrointestinal discomfort (bloating) was reported by some participants but reduced over time. Dietary fibre present in seaweed is known to alter gut microbiome, particularly in the presence of a low fibre diet, which is the case here. Positive effects such as hair/nail growth, increased energy, and reduction in premenstrual symptoms. For example 6% reported they had no PMS symptoms before seaweed. After 8 weeks 26% reported no symptoms, a 5 times decrease.

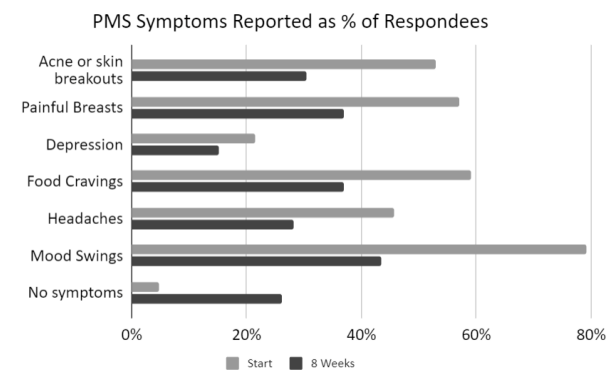


Figure 3, Reported reduction in PMS symptoms after seaweed consumption after 8 weeks

Implications

In this study we observed a decrease in menstrual pain and bleeding days in women who had consumed 2.5 grams of dried red seaweed for two menstrual periods. This is consistent with findings noted by Skibola [23] who reported reduced pain, resumption of normal cyclicity and reduced bleeding in three women consuming the brown seaweed *Fucus vesiculosus*. This study is the first to trial a safe, red seaweed for attenuation of menstrual abnormalities.

Seaweed in a nutrient dense food with known functional properties in both whole foods and extracts. seaweed has a medicinal action in women. The complexity of both known and novel molecules within seaweed means that identification or refinement of the active molecules may be a long process. In the meantime, as a functional food, we know that seaweed is both safe and medicinally effective.

There are some questions to be raised. Some seaweeds act as oestrogen modifiers [19], hence, does it act as a contraceptive in a similar way to hormonal contraceptives that alter the balance of oestrogen to progesterone during a menstrual cycle? Because *Kappaphycus alvarezii* has been consumed as a food for centuries in countries with high birth rates and low infertility, this is unlikely. This seaweed is known to act as an anti-inflammatory agent, likely through phospholipase inhibition [17] thus likely exerts a similar action of cyclooxygenase inhibition (COX) as known treatments for menstrual disorders such as Mefenamic Acid. The main difference here is the limited side effects alongside the beneficial effects of high nutrient and microbiota alterations.

Conclusion

The red seaweed *Kappaphycus alvarezii* offers a safe and effective treatment for dysmenorrhea and menorrhagia. Menstruation is preserved thus providing a culturally acceptable treatment, while also allowing for normal conception.

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