ABSTRACT

Menopause has been known to disrupt the harmony in the cardio-metabolic and related systems in females. The different level of saturation of risk factors in women, together with their interaction with female hormones, plays an important role in the development of cardiovascular disease. This coupled with the distressingly high statistics of adverse cardio-metabolic events occurring in women worldwide raises a concern and given that middle aged women form a sizeable element of the Indian demography, the health expenses incurred towards chronic disease alleviation by this huge segment of the population would be a cause of grave concern for the stakeholders. However, to sketch conclusive decisions on the interventions and the extent of coverage, comprehensive studies spanning the complete picture of the metabolic and cardio-vascular risk factors across a significant part of the Indian population is a pre-requisite. But in this regard, most of the studies are on the western population and data on ethnic women is lacking.

Research in the area of menopausal health has speculated that nutraceutical compounds and functional foods are promising and so is the case with herbal supplements with regard to hyperlipidemia. However discreetly designed trials on Indians are scarce and fail to provide any conclusive evidence. One breakthrough that the field of nutraceuticals has witnessed is Wheatgrass, which is proposed to have remarkable antioxidant capacity, which can prove to be a functional food for the management of chronic diseases.

Thus the following set of studies was conducted with the following objectives:

- To study the clinic-biochemical changes in pre, peri and post menopausal women in a free-living population versus in women from a clinical setting
- To study the longitudinal outcomes of a health checkup in middle aged women
Abstract

- To study the nutrient content of freeze-dried wheatgrass powder and acceptability of wheatgrass incorporated common Indian recipes
- To study the impact of wheatgrass powder supplementation on atherogenicity, inflammation and menopausal symptoms in primary hyperlipidemic women

For studying the clinico-biochemical changes in pre, peri and post menopausal women in a free living population, 186 women (30-65 years) were enrolled from four zones of the city. For comparison with women from a clinical setting, 213 pre peri and post menopausal women attending a health check-up facility in Ahmedabad were enrolled. The cardio-metabolic risk factors were studied using standard physical, bio-physical and bio-chemical methods in both the settings. Overall obesity was found to be 67.4%, with post menopausal women having a prevalence of 75% and premenopausal women 53%. Prevalence of high waist circumference was the highest (90.5%). Extent of menopausal ranged from 17% - 22%. Almost 49.3% had Hypertension and 25.8% were pre-hypertensive. The prevalence of obesity was supported by the lifestyle habits of the subjects, with an unhealthy frequency of snacking (41% more frequently than once a week), consumption of bakery/confectionery items (40% more frequently than once a week). In addition, sedentary behavior was seen in 60.7% and the mean fat intake of the subjects was 176% of the recommended daily limit.

Around 6.1% of the subjects were diagnosed with diabetes while as high as 25.7% had insulin resistance (HOMA 2). Almost 33.8% of the subjects had hypercholesterolemia, 17% had elevates triglycerides. An astounding 65.2% had high LDL cholesterol and 47.3% had low HDL and 35.8% had metabolic syndrome. An unexpected 46.4% of the subjects were found to be anemic. Osteoporosis was diagnosed in 11.9% of the women, in a subsample of 67 women. As high as 86.5% of the subjects had >30% calories from fat. Post menopausal status was found to be a significant predictor of hypertension and diabetes (OR 4.6 and 5.4 respectively; 95% CI: 2.4 – 8.8 and 1.7-19.1 respectively; p<0.001). A model consisting of BMI,
WC and SBP was able to explain 58% of variance in SBP. The key difference between the subjects from a clinical setting versus those from a free living population was that former had a higher prevalence of severe obesity (29% vs. 19%), insulin resistance (31% vs 21%), TC (39% vs 27%) and LDL (73% vs 57%), suggesting higher body fat and circulating fat and higher prevalence of menopausal symptoms, suggesting increased estrogen withdrawal.

Thus, the burden of cardio-metabolic derangements in middle aged women is alarmingly high and is aggravated by the menopausal transition. Anthropometric parameters are able to predict much of the cardio metabolic risk scenario in these women. The situation is worse off in women from a clinical setting, indicating the fact that they present for a check-up after the risk situations have aggravated quite a bit. A holistic intervention to target endocrinological changes and resulting metabolic changes is the need of the hour.

For studying the longitudinal trends in the body composition and blood pressure of menopausal women, the women studied in the first phase from a free-living population, were followed up after 2 years. During the exploratory research, the women who had elevated levels of risk factors studied in that phase, were informed of their high risk situation and were asked to see a doctor for further diagnosis and treatment, if any. After a period of two years, of the 186 subjects studied in the exploratory research phase, 107 could be followed up, because 27 had permanently moved, 42 were temporarily unavailable because of either being out of station or having changed their contact details, 7 were not willing to share any details and 3 unfortunately, had expired. The results indicated that the mean weight of the subjects during the time of the initial health checkup was 64.47kg, which had mildly increased to 64.50kg after a period of 2 years. The mean waist circumference of the subjects had also increased slightly from 95.54cm at baseline to 95.97cm at the end of 2 years. The mean blood pressure of the subjects had reduced from 130mmHg to 127mmHg SBP, and DBP had reduced from 82mmHg to 79mmHg. Regarding the health seeking practices of the subjects, it was observed that of the 107 subjects
that were followed up, 39.9% were not diagnosed with any risk situation, of the remaining 61.1%, only a mere 3.04% had seen a doctor and rest of them (57.7%) had not taken any action after getting the results of the health check up. This takes attention to the fact that the health seeking practices of women in India is abysmally low, awareness needs to be created among them so that they realize that health consultation if sought early, will revert most of the adverse health conditions they are predisposed to.

The nutrient component analysis included quantitative testing of energy, protein content, total fat, fibre, iron, moisture, ash, carbohydrate & sugar content, ascorbic acid, and β carotene. It was found that wheatgrass has excellent nutrient content as reflected by its high iron content (57.9mg) and β-carotene content (360μg). For testing the acceptability, five recipes: Khakhra, Thepla, Muthiya, Dal and Buttermilk, which involve different method of cooking were selected and wheatgrass was incorporated at levels 1g, 1.5g and 2g per serving in case of Muthiya, dal and Buttermilk and per unit in case of Khakhra and Thepla. The acceptability of the organoleptic attributes was evaluated using sensory evaluation employing the Composite scoring test, by a semi trained panel of 12 subjects. The mean scores for Dal, buttermilk, Khakhra, Muthiya and Thepla were 7.0, 6.5, 6.9, 6.5, 7.3 respectively, which was indicative of good acceptability. It was observed that the acceptability was higher in recipes with low water content like Khakhra and Thepla, than recipes with high water content viz., Dal, Buttermilk and Muthiya. Therefore, wheatgrass will have excellent acceptability if used as a functional food component in day to day recipes and its nutritional quality can serve to ameliorate various chronic health conditions.

For evaluating the effect of wheatgrass (Triticum aestivum L.) on menopausal health, hyperlipidemia and inflammation, a randomized controlled study design was employed wherein, 59 mildly hyperlipidemic menopausal women served as participants. Here 3.5g of freeze-dried wheatgrass powder in encapsulated form was administered to the participants in the intervened group (n=29) daily for a period of 10 weeks, while the control group (n=30) received no intervention. At the end of the
intervention period, the prevalence of menopausal symptoms saw non-significant, but noteworthy reductions: vasomotor symptoms came down by 42%, somatic symptoms 33%, psychological symptoms 50%, while urogenital symptoms remained unaltered. Experimental group showed significant 5.3% reduction in total cholesterol (p<0.01) and 13% reduction in apo B (p<0.001); near-significant reduction of 9.7% in triacylglycerols (p=0.07); and significant decrease of 6% in high density lipoproteins (p=0.05); while C – reactive protein levels remained unaltered. Thus the abundance of nutraceutical compounds in wheatgrass exerts beneficial effects on both the atherogenic indices and menopausal symptoms in hyperlipidemic women.

Thus the present study found that women have a high degree of cardio-metabolic risk factors coupled with equally high degree of endocrine imbalances attributable to menopausal transition. However, their poor, untimely health seeking practices do not make up for this elevated risk situation. Freeze-fried wheatgrass powder showed promising hypolipidemic effects and menopausal symptoms alleviating properties in primary hyperlipidemic women and hence can be a useful holistic adjunct therapeutic strategy in the management of primary hyperlipidemia in menopausal women.