

An Analytical Study on Effect of Dishwashing Working Place on Human Body

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ABSTRACT Energy expenditure, pulse rate and angles of body bend was measured at standing posture for ten female post graduate students. The subjects were selected based on elbow height and the body positions studied for dishwashing were sink at elbow height, sink at 10 cm less than elbow height, sink at 20 cm less than elbow height and at laboratory sink height of 76.5 cm. It was observed that, sink height of 10 cm less than elbow height was found more suitable because of less energy expenditure (1.72 k cal/min), least pulse rate (91.99 beats/min) and less angle of body bend (102°). Hence, sink at 10 cm less than elbow height can be suggested as optimum sink height.

Dishwashing is an activity which causes a lot of physical stress to the human body in terms of energy expenditure. Moreover it is least liked by the housewives in India (Deol, 1973). The average energy consumption of home makers varies from 2300 to 2400 kcal per day (Grandjean, 1973). The energy expenditure is the objective measurement of physical cost of work. Hanson and Jones (1970) reported that the heart rate differed significantly among many postures but not between the conditions of the task. Dish washing though an important household activity, has

yet remained unattempted to know more scientifically. So, the present study was undertaken to assess the effect of the activity on heart rate, energy expenditure and angles of body bend while cleaning the dishes at different sink height levels and to suggest the optimum sink height based on the low energy expenditure and less angle of body bend.

Based on the elbow height ten female post graduate students were selected for the experiment. The activity was carried out in standing posture. The body positions studied for dish washing were, sink at elbow height, sink at 10 cm less than elbow height, sink at 20 cm less than elbow height and at laboratory sink height of 76.5 cm.

The energy expenditure during the work was estimated with the help of an average working pulse rate, by using the following formula (Rao, 1987). It is expressed in kilo calories per minute.

$$0.0359 \times \text{WHR} - 1.398 \times X/50 = \text{Estimated Energy Expenditure}$$

Where,

0.0359 - Constant

WHR - Working heart rate

X - is observed weight

50 - Constant (mean body weight)

1.398 - Constant

Table 1: Energy expenditure while cleaning the dishes

S. No.	Elbow height	Body weight	Sink at elbow height Energy expenditure in Kcal	Sink at 10 cm less than elbow ht. Energy expenditure in Kcal	Sink at 20 cm less than elbow ht. Energy expenditure in Kcal	Laboratory sink (76.5 cm) Energy Expenditure in Kcal
1.	95	47	1.50	1.48	1.75	2.03
2.	95	45	1.77	1.63	1.87	2.05
3.	96	50	1.86	1.66	2.33	2.40
4.	97	40	1.75	1.71	1.86	1.95
5.	97	45	1.61	1.61	1.87	2.08
6.	97	49	1.94	1.62	2.04	2.33
7.	98	41	1.67	1.65	1.84	1.86
8.	99	46	2.05	2.01	2.17	2.26
9.	99	47	1.89	1.85	2.08	2.18
10.	100	47	2.10	1.07	2.22	2.27
Mean	97.30	46	1.81	1.72	2.00	2.14

Table 2: Angles of body bend while cleaning the dishes under laboratory conditions

Elbow height	Back			Neck and Head			Arm		
	Sink at elbow ht.	Sink at 10 cm less than elbow ht.	Sink at 20 cm less than elbow ht.	Lab. sink (76.5 cm)	Sink at elbow ht.	Sink at 10 cm less than elbow ht.	Sink at 20 cm less than elbow ht.	Lab. sink (76.5 cm)	Sink at elbow ht.
95 cm	Straight (90°)	115° (90+25°)	131° (90+41°)	137° (90+47°)	Straight (90°)	117° (90+27°)	131° (90+41°)	131.5° (90+41.5°)	Right angle (90°)
96 cm	Straight (90°)	113° (90+23°)	122° (90+32°)	130° (90+40°)	Straight (90°)	105° (90+15°)	132° (90+42°)	142° (90+52°)	Right angle (90°)
97 cm	Straight (90°)	109° (90+19°)	119° (90+29°)	140° (90+50°)	Straight (90°)	112° (90+22°)	126° (90+36°)	128° (90+38°)	Right angle (90°)
98 cm	Straight (90°)	106° (90+16°)	118° (90+28°)	131° (90+41°)	Straight (90°)	114° (90+24°)	114° (90+24°)	123° (90+33°)	Right angle (90°)
99 cm	Straight (90°)	104° (90+14°)	114.5° (90+24.5°)	132.5° (90+42.5°)	Straight (90°)	102.5° (90+12.5°)	105.5° (90+15.5°)	112° (90+22°)	Right angle (90°)
100 cm	Straight (90°)	104° (90+14°)	120° (90+30°)	130° (90+40°)	Straight (90°)	104° (90+14°)	112° (90+22°)	119° (90+29°)	Right angle (90°)

It is observed that an overall mean energy expenditure was more while cleaning dishes at laboratory sink height (2.14 kcal per minute) followed by sink at 20 cm less than elbow height (2.00 kcal per minute) and sink at elbow height level (1.81 kcal per minute) cleaning dishes at sink height of 10 cm less than elbow height was found more suitable as it consumed less energy i.e., 1.72 kcal per minute when compared to other sink heights (Table 1).

The pulse rate was recorded thrice with an interval of one minute and it was observed that, sink at 10 cm less than elbow height was found to be more suitable as an average working pulse rate was found to be less (91.99 beats/min) when compared to all other sink heights.

The angles of the body bend (Table 2) disclose that, the sink at 10 cm less than elbow height was found to be the better when compared to other sink heights, as the forward bending of back, neck, head and arm extension was less for all the subjects when compared to other two sink heights i.e., sink at 20 cm less than elbow height and at laboratory sink height. This could be due to too much of bending forward, and this may lead to compression of organs and there by increasing the pulse rate. Dhillon (1982) also pointed out that, various body positions accounted variations in the heart rate.

Thus, it can be concluded that dishwashing at sink height of 10 cm less than elbow was found to be more suitable as it revealed, less energy expenditure, less pulse rate and less angles of body bend.

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