

# DESIGNING OF WOOLLEN FUNCTIONAL CLOTHING SPECIALLY FOR LACTATING WOMEN OF UTTARAKHAND

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**ABSTRACT:** The present study was conducted to design the woollen functional clothing for lactating women. The study was conducted on 360 lactating women of Haldwani (Nainital), Uttarakhand. The interview schedule was used as a tool in survey method for collection of data regarding their clothing requirements during lactation. On the basis of their requirements there were designed and developed functional clothing in Adobe illustrator CC 2015 software. The results revealed that the that 79.4 percent lactating women required the long length (87.06 percent), loose fit (73.08) and bright colour (74.76 percent) of kurties with horizontal (71.68 percent) opening of zipper and button (50.70 percent) during lactation followed by sari (18.9 percent) and gown (1.7 percent). The coaty style kurti has got I rank after wear trial by lactating women followed by princess line kurti and poncho style kurti that got ranks II and III, respectively. It is concluded that these woollen kurties are somewhat suitable to highly suitable for lactation with their different classic specification. These functional clothing have their special advantages while feeding in public place and health benefits as well. With these special functional clothing women feel more secure and protect while they are out from home.

**KEY WORDS:** 1. Adobe Illustrator CC 2015, 2. Garments designing, 3. Functional Clothes, 4. Lactating women, 5. Winter wear.

## I. INTRODUCTION

Dress designing is an important field in textiles. Beside fabric quality and fabric formation, designing is also most important element to attract consumer for garments purchasing. Creating a design for garments is not a casual and simple process. It is a useful creation in which emotion, knowledge, imagination as well as intellect are operative. Jyoti and Fatima (2009) defined, “designing refers to the total composition of line, color, form, shape and texture in decorative manner”. The conventional method of designing was tedious, time consuming and laborious, considerable skills and experience were required to produce a design. A number of software are used in apparel designing such as Corel Draw, Adobe Illustrator, Karat Cad, Adobe Photoshop and TUKA Cad concentrated on practical use of computers in pattern design and product development (Yadav and Madhusoothan, 2006).

Adobe illustrator, vector drawing and editing software, has created a new room for designer work. There are various tools with options that create a wide range of strokes, shapes and patterns along with freehand or assisted drawing feature. With Illustrator, creating customized patterns, textures and designs are very convenient (hamstech.com, 2017). The textures can also be applied to garment sketches seamlessly with the clear detailing of features like pattern direction, colour transitions and intensity. In fashion, the success of a design not depends only on the perfection of its illustration but the presentation of ideas. When both these factors are done on a digital platform, the results are bound to be quite impressive.

The end use of garment is fulfilling after satisfied the needs of consumers. The life cycle of any product is not completed without designing. Designing of garments can improve the wearer’s appearances and hiding revealing parts of body as well as give aesthetic pleasure to wearer. Due to the modernization of era women are more empower from earlier time. There demands of clothing were rapidly changes over a time. They are more concern regarding their looks and needed special dress during pregnancy and lactating period. Special dresses for maternity wear come under the functional clothing that helps them for feed easily at anywhere at place. These maternity dresses makes the women empower to in public platform. Functional clothing for maternity wear is ergonomically designed to have a minimum inhibitory effect on movement and provide maximum comfort and performance to the user.

Hence, dress designing is an important aspect in apparel manufacturing industries. It is considered that a dress should be suitable for the person for whom it has been designed. According to Arya and Singh (2016), some of the important considerations which should be taken are climate of the region, season of the year for which the garment is made, the time or type of occasion when it is most likely to be worn, the type of role and age of person. As the need regarding clothes varies, the choice of color, material and print also differs from person to person. These variations are due to difference in age, personality, sex and role the individual has to play. Every change in life situations like entering school, college, getting a job, marriage, parenthood, and lactation requires a change in wardrobe. Even in the course of daily life situation, requires a change in clothes to facilitate and symbolize the situational change.

Hence, the functional clothes are needed for lactating women to feed freely without any hesitation. WHO recommended for exclusive breastfeeding for infants for first six months of life, but many of them were unable to continue breastfeed for recommended duration. Reason may be women are facing physical, social, emotional and psychological problems during lactation. So, this time changes the women clothing demand from another period of life. The women need absorbent type texture, looseness (comfort) and the most important is specially designed dress so that she has no need to lift up the dresses while feeding her child and has extra room for free movement. The specially designed functional clothes encourage the mother and infant bonding. Women were initiating the exclusive breastfeeding during life and continued breastfeed through to at least first two years with subsequent reduction in burden of feeding. This breastfeeding practice also reduces the risk of breast and ovarian cancer, and it induces uterine contraction that reduces the mother's risk of postpartum haemorrhage, and it is also a natural barrier to conception in first six months of life.

#### Purpose of Study

Functional clothing is an emerging field in textiles. There is a need to explore the clothing problems of lactating women and designing of woollen garments. This study is beneficial for lactating women, to improve their knowledge that helped them to select woollen functional clothing. This will also make women comfortable and at the same time conceal their breast part in winters. Moreover, their special knowledge of fabric, fasteners and clothing construction together with the information obtained from this study; would enable the manufacturers and designers to design and construct suitable garments for the lactating women. Keeping all these points in mind, the present study was conducted under the following objectives:

1. To develop designs through Adobe Illustrator CC 2015 according to the requirements of lactating women.
2. To assess the suitability of constructed woollen functional clothing by lactating women.

## II. MATERIAL AND METHODS

**Locale of Study:** The lactating women were selected from the maternity care centres of Haldwani (Nainital), Uttarakhand.

**Sample Selection:** Total 360 lactating women were selected for survey, to know their requirements for designs to be made for feeding. Random sampling was used for collection of data through interview schedule.

**Designing of Woollen Functional Clothing by using Adobe Illustrator CC 2015:** Garment designing was done on the basis of fabric properties while taking three important points into consideration i.e. price, performance and suitability for the purpose. Different characteristics of wool and wool union fabric i.e. fabric texture, appearance, fabric fall, suitability of fabrics and thermal properties were taken into consideration, while designing of functional clothes i.e. kurties for winter wears. Total 12 designs were developed on the basis of the requirements of lactating women in Adobe Illustrator CC 2015 (Figure 1). Description of developed designs of winter wear kurties are as follows:

**Design 1:** It is consisted of concealed vertical zippers under the flap at princess line, mandarin collar, full sleeves along with decorative buttons in front of kurti.

**Design 2:** Kurti with round neckline and full length sleeves. Detachable breast pad is also being used for absorption of breast milk along with horizontal zipper below the bust level.

**Design 3:** It is simple calf length kurti with round neckline and full sleeves. This consists of two horizontal zippers at bust level.

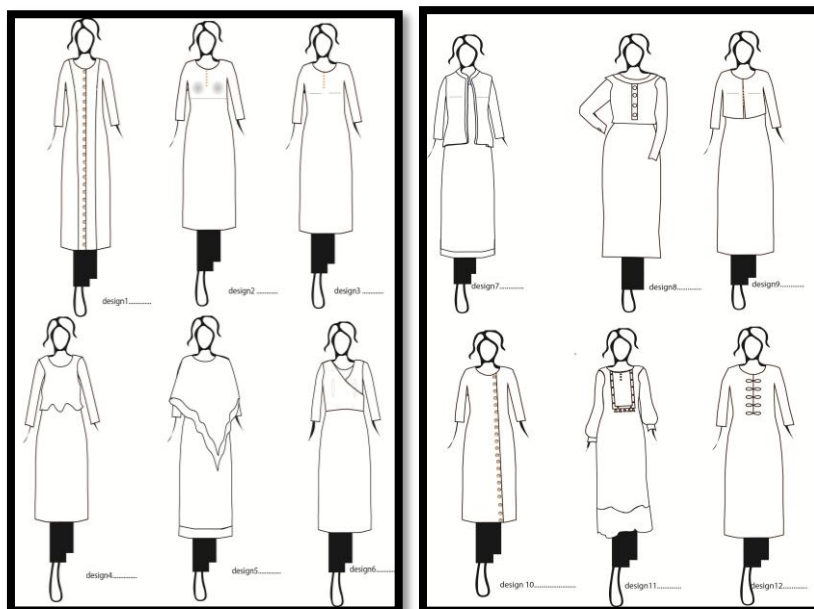
**Design 4:** It consists of elasticated horizontal concealed nursing accesses inside the fabric fall at bust level. Rounded collar neckline kurti looks beautiful with calf length and full sleeves.

**Design 5:** Poncho style kurti was used for breastfeeding that helps to hide breast, while feeding at public place. It also gives warmth. Kurti is designed with round neckline and full sleeves along with single zipper opening below the bust level.

**Design 6:** Kurti design is having flattering crossover designs highlighting empire waistline, which is beneficial for nursing, along with v-neckline and full sleeves. Kurti have plenty of falls around the waist lines.

**Design 7:** Detachable coaty style kurti design was developed for breastfeeding; having rounded neckline along with both side zippers at bust level. Coaty in kurti helps to conceal the bust areas during breastfeeding.

- Design 8: Centre front buttons opening along with calf length and full sleeves in kurti helps to feed.
- Design 9: Half coaty style kurti consisted of horizontal zippers opening and rounded neckline. This is long calf length kurti with full sleeves.
- Design 10: The kurti is consisted of side button opening with full sleeves and calf length.
- Design 11: Kurti with both side vertical buttons opening in the yoke that helps to feed easily during lactation.
- Design 12: Centre front press buttons opening are used along with full sleeves and calf length in kurti.



**Figure 1: Developed designs of 12 Kurties in Adobe Illustrator CC 2015**

Thereafter, the colour was also applied in selected designs for improvement its appearance. As the results obtained in the present investigation, the sky blue, pink and yellow colour shades were applied on top three selected designs. The adobe illustrator was found very helpful for applying and visualizing the various colour combination of final garments without any wastage of material and production cost.

**Construction of Garments:** After the assessment of garment’s requirement, the drafting for selected designs was prepared. Basic blocks for different designs were made and then modified according to the requirements of the design. The garments were constructed by using pure wool, wool/cotton and wool/eri silk fabrics. Parameters used while developing designs were protection, comfort, fastener’s opening, modesty and overall appearance of the garments. Thereafter, the garments were designed according to the mean size of the lactating women of Kumaun region, Uttarakhand.

**Suitability Assessment of Developed Garments through Wear Trial Method:** In this study, 30 lactating women of middle income group families were selected, who are willing to wear the kurties. Lactating women had worn the kurties for 1 hour and performed various tasks like feeding, sitting, bending, standing including wearing and wearing out the dresses. These dresses were worn by respondents in moderate winter season viz. October to February (15°C - 22°C). The parameters of garments suitability such as skin feel, comfort, coverage, seasonality, fit, design and functional features was evaluated after wear trial.

**Cost Evaluation of Garments:** It is very important step of any garment production process to decide its selling cost. So here approximate cost of all type of woven fabrics was calculated after adding 17 percent profit. Goel (2008) was also adopted the same method of garments costing. Cost of yarns and weaving was added into per square meter of fabric. The designing, cutting, stitching, labour cost and trimming charges of garments were also added to estimate the final cost.

**III. RESULTS AND DISCUSSION**

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads:

**Table 1: Mean, standard deviation and variance of age and body measurements of lactating women (N=360)**

Sr. No.	Age & Body measurements	Mean	Standard Deviation	Variance
1.	Age of participant (years)	27	3.386	11.466
2.	Bust measurement (inches)	36	3.462	11.987

3.	Waist measurement (inches)	34	4.196	17.608
4.	Hip measurement (inches)	39	3.66	13.403
5.	Height (cm)	157	6.394	40.877
6.	Weight (kg)	54	10.19	103.858
7.	BMI	21.60	3.86	14.939

It was found from Table 1 that the mean age of lactating women was between 27 years. It was also observed that mean bust, waist and hip measurements of lactating women were 36 inch, 34 inch and 39 inch, respectively. Arya *et al.* (2017) were constructed the kameez of 36 inches bust size for lactating women with incorporated features of functionality and attractiveness according to the lactating women preferences. The mean height, weight and BMI of lactating women of this region were 157cm, 54kg and 21.6, respectively. Ettyang *et al.* (2005) revealed the general and biochemical data for the mothers measured during the 3rd trimester of pregnancy as well as during the lactation period (2–4 months after birth). There were significant ( $p < 0.05$ ) reductions in BMI from 19.8 (1.3) to 18.5 (1.0) in pregnancy to lactating.

Table 2 shows details of garment features required in functional clothing of lactating women. It was found that 79.4 percent lactating women required the long length (87.06 percent), loose fit (73.08), and bright colours (74.76 percent) of kurties with horizontal (71.68 percent) opening of zipper and button (50.70 percent) at breast in lactating dresses. All of these requirements and features were being adopted to produce the functional clothing for lactating women. The sari (18.9 percent) was second preference of lactating women with designer blouses having vertically aligned buttons in centre front instead of hooks and zipper. It was observed that those women feel more comfortable to feed their infants in sari are mostly of lower socio economic status as compared to middle and higher socio economic status. Less number of lactating women i.e. 1.7 percent was preferred gown as a feeding dress. Morris *et al.* (2017) also revealed the need of functional clothing in their study. It was found that postpartum women who wish to engage in physical activity and breastfeed their children are at greater risk for breast soreness due to increased breast volume and sensitivity associated with breastfeeding. An apparel product that supports both good breastfeeding practices and physical activity has the potential to improve the health of both mother and child.

**Table 2: Required features in construction of functional clothes**

(N=360)

Garment features	Garment specifications	Sari-Blouse (18.9%)		Kurti (79.4%)		Gown (1.7%)	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
		Blouse specification		Kurti specification		Gown specification	
1 Preferred length	Short	66	97.05	37	12.94	--	--
	Long	2	2.95	249	87.06	6	100
2 Type of fit	Loose	60	88.23	209	73.08	4	66.67
	Tight	---	--	2	.69	--	--
	Normal	8	11.76	75	26.22	2	33.33
3 Preferred opening	Vertical	67	98.53	48	16.78	2	33.33
	Horizontal	1	1.47	205	71.68	4	66.67
	Horizontal & vertical	--	--	33	11.54	--	--
4 Type of fasteners	Button	54	79.41	102	35.66	1	16.67
	Hook eye	1	1.47	3	1.05	--	--
	Press button	--	--	7	2.25	--	--
	Zipper	13	19.12	29	10.14	5	83.33
	Zipper & button	--	--	145	50.70	--	--
5 Type of colour	Bright colour	6	8.82	213	74.76	5	83.33
	Light colour	62	91.17	72	25.17	1	16.67
	Neutral	--	--	1	.35	--	--

**Table 3: Designs of kurties preferred by lactating women for winter seasons**

(N=360)

Designs of Kurties	WMS	Top Ranks of Kurti Designs
Preferred sari blouse during Lactation (66 respondents)		
Nil	00	00
Preferred kurti designs during Lactation (294 respondents)		
Design 1*	2.57	I
Design 2	2.20	IV

Design 3	1.97	V
Design 4	1.52	XII
Design 5*	2.33	II
Design 6	1.53	X
Design 7*	2.31	III
Design 8	1.86	VI
Design 9	1.61	IX
Design 10	1.65	VII
Design 11	1.62	VIII
Design 12	1.51	XI

1) WMS= Weighted Mean Score and 2) \*= Selected designs for kurties

Weighted mean scores (WMS) and ranks of kurti designs for lactating women are given in Table 3. It was found that 66 lactating women out of 360 were not interested to wear designed functional kurties because they wear only saris. It was depicts that kurti design 1(vertical zipper opening in princesses lines) got I rank with highest WMS 2.57 followed by kurti design 5 (Poncho with zipper below bust) and kurti design 7 (coaty with zipper both side at bust level) got II and III ranks with WMS 2.33 and 2.31, respectively. Kurti design 4 with elastic opening has got all time lowest rank; because, respondents said that feeding of infants with elastic opening dresses is very difficult because infants may anytime pull the clothes anywhere while feeding. Arya *et al.* (2017) were reported similar types of results in their study. Design with jacket, horizontal opening and side pleats were highly suitable designing features of Kameez for urban lactating women. Princess line design with opening, design with yoke and design with centre front long opening were also found suitable during lactating.

Wear trial was demonstrated to be an effective method in clothing research to identify the underlying physical causes of discomfort and to evaluate clothing performance. It simulates the conditions similar to those experienced in ‘normal’ wear (Saville, 2004). Analysis of suitability assessment parameters of kurties were given in Table 4 and wear trial designs given in Plate 2. The research hypothesis was tested by using 5 point likert scale. The research question is as follows: Were these functional clothing of wool union fabrics helpful for lactating women?

**Table 4: Suitability assessment of kurties of pure and union wool fabrics**

(N=30)

Sr. No.	Parameters of Garments suitability	Princess line Kurti		Poncho Style Kurti		Coaty Style Kurti	
		WMS <sup>#</sup>	Rating scale*	WMS <sup>#</sup>	Rating scale*	WMS <sup>#</sup>	Rating scale*
1.	Length of kurti	3.77	S	3.73	S	4.3	HS
2.	Skin feel of kurti	4.13	HS	4.46	HS	4.5	HS
3.	Comfortable during feeding	3.83	S	3.63	S	4.47	HS
4.	Appearance of kurti after wearing	4.57	HS	3	SS	4.9	HS
5.	Modesty (coverage) of kurti during feeding	3.93	S	1.86	LS	4.7	HS
6.	Functionality of kurti						
	i. Placement of opening	4.03	S	1.73	US	4.8	HS
	ii. Length of opening	4.13	S	1.7	US	4.73	HS
	iii. Easy to fasten and unfasten	4.1	S	2.36	LS	4.67	HS
7.	Overall fitting of kurti	3.97	S	2.77	SS	3.93	S
8.	Overall designing features in kurti	3.97	S	2.27	LS	4.73	HS
9.	Overall suitability of kurti for winter wears	4.63	HS	3.2	SS	4.67	HS
10.	Overall acceptability of kurti	4.17	S	2.83	SS	4.73	HS
11.	<b>Overall WMS<sup>#</sup></b>	<b>4.09</b>	<b>S</b>	<b>2.86</b>	<b>SS</b>	<b>4.59</b>	<b>HS</b>

1) <sup>#</sup> WMS= Weighted Mean Score

2) \*US= Unsuitable, LS= Least Suitable, SS= Somewhat Suitable, S= Suitable, HS=Highly Suitable

Table 4 depict the suitability assessment of kurties of pure wool, wool/ eri silk and wool/ cotton union fabrics. It shows that coaty style kurti was found to be highly suitable (WMS 4.49) for lactating women followed by princess line kurti (WMS 4.09) was suitable and poncho style kurti (WMS 2.86) somewhat suitable in feeding, respectively. Coaty style kurti was found to be highly suitable for lactating women because it looks good in appearances and colour combination reported by respondents. The second reason might be that the coaty

was hiding fasteners opening and gives support to infants feeding. The princess line Kurti was the second preference of the lactating women. Colour combination, hand feel, comfort and fasteners placement was being suitable for infants' feeding. But, the respondents were felt uncomfortable during feeding in poncho style Kurti due to placements of zipper below the bust as well as use only one zipper. The respondents reported that horizontal opening with two zippers at bust level were better instead of one zipper in functional clothing. It shown in figure 2 that subject was satisfied with the functional kurties. Arya *et al.* (2017) studied on design and develop functional clothing for a lactating woman. After designing preference was taken by lactating mothers and top six preferred designs were constructed and given to the lactating women for wear trial. The related data highlights that design 1 with jacket was ranked 1st on overall basis (4.68) followed by design 3 having side pleat (Rank II, 4.59) , design 2 with horizontal opening (Rank III, 4.47) and design 6 with yoke (Rank IV, 4.32). Design 6 with princess line and 4 with centre long front opening having average mean score 4.20 and 4.13, respectively were assessed next in their rank orders.



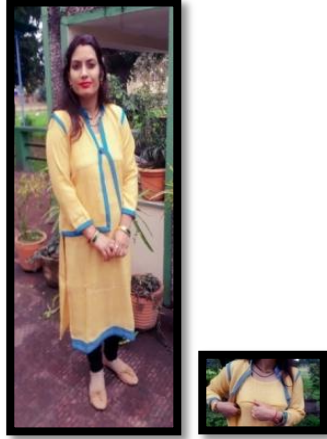
		
<p>Specifications of Princess line Kurti:</p> <ol style="list-style-type: none"> <li>1. Fabric- Pure wool</li> <li>2. Opening- Vertical zipper opening at princess line</li> <li>3. Neckline- Mandrain collar</li> <li>4. Length- Long</li> <li>5. Contrasting stripe with front buttons</li> <li>6. Used in winter season</li> </ol>	<p>Specifications of Poncho style Kurti:</p> <ol style="list-style-type: none"> <li>1. Fabric- Wool/eri silk union</li> <li>2. Opening- Single horizontal zipper opening below the bust in kurti</li> <li>3. Neckline- Rounded neckline</li> <li>4. Length- Long</li> <li>4. Poncho covered body during feed</li> <li>6. Used in winter season</li> </ol>	<p>Specifications of Coaty style Kurti:</p> <ol style="list-style-type: none"> <li>1. Fabric - Wool/cotton union</li> <li>2. Opening- Double horizontal zipper opening at bust in kurti</li> <li>3. Neckline- U shape neckline</li> <li>4. Length- Long</li> <li>5. Coaty concealed zipper opening of kurti</li> <li>6. Used in winter season</li> </ol>

Figure 2: Wear Trial of developed Kurties by Lactating women

Table 5: Total cost evaluation of Princess Line Kurti, Poncho style Kurti and Coaty style Kurti

Sr. No.	Parameters	Princess line Kurti	Poncho Style Kurti	Coaty Style Kurti
1	Material type	Pure wool	Wool/ Eri silk	Wool/ cotton
2	Material Cost (₹)	513	1109	515
3	Trimmings cost (₹)			
	• Buttons	55	25	5
	• Zippers	20	20	20
4	Labour Cost (₹)			
	• Designing Cost	300	300	300
	• Stitching Cost	200	400	400
Total Cost (₹)		1068	1855	1240
Profit Percent (%)		17	17	17
Selling Price (₹)		1250	2170	1450

From Table 5 that the cost of the final kurties made from pure wool (100:0), wool/ eri silk (50:50) and wool/ cotton (50: 50) fabric were calculated by adding the cost of material, trimmings, labour cost and profit percent. Goel (2008) were also calculated the total cost of their products based on these parameters. It was found that the selling price princess lines kurti of pure wool fabric is approximately ₹ 1250 per piece. Poncho

style kurti made from wool/eri silk fabric is having selling cost ₹ 2170 per piece. Total cost of coaty style kurti made from fabric wool/cotton cost is ₹ 1450 per piece. It is clear that the cost of all the products was different due to the variation in yarn types, design types and trimmings and so as the cost of these.

#### IV. CONCLUSIONS

It is observed from the study that the mean age of lactating women were between 27 years. The designing of functional clothing i.e. kurties were based on mean size of lactating women. It was found that 79.4 percent lactating women required the long length (87.06 percent), loose fit (73.08), and bright colours (74.76 percent) of kurties with horizontal (71.68 percent) opening of zipper and button (50.70 percent) at breast. There were developed twelve designs of functional kurties in Adobe Illustrator CC 2015. It depicts that kurti design 1 (vertical zipper opening at princesses lines) got I rank with highest WMS 2.57 followed by kurti design 5 (Poncho with zipper below bust) and kurti design 7 (coaty with zipper both side at bust level) got II and III ranks with WMS 2.33 and WMS 2.31, respectively. Thereafter, wear trial shows that coaty style kurti was found to be highly suitable (WMS 4.49) for lactating women followed by princess line kurti (WMS 4.09) was suitable and poncho style Kurties (WMS 2.86) somewhat suitable in feeding. The selling price of kurties was approximately ₹ 1250 to ₹ 2170 per piece. It is clear that the cost of all the products was different due to the variation in cost of yarn types, design types and trimmings. It is concluded from the study that the woollen functional clothing was somewhat suitable to highly suitable for lactating women. It helps to save their health and comfortably feed to infants in public places without any hesitation. This type of designs and constructions of functional clothing can boost up the confidence of lactating mothers to breastfeed in the public places and thus ultimately breaking psychosocial barriers to breastfeeding and also enhance psychological comfort by lifting their self esteem.

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