



**Faculty of Engineering
Department of Textile Engineering**

**REPORT ON
Study on the Quality Assessment of children clothing in
Bangladesh**

**Course Title: Project (Thesis)
Course Code: TE - 4214**

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of
Bachelor of Science in Textile Engineering.

Advance in Apparel Manufacturing Technology

Summer- 2019

DECLARATION

I hereby declare that this submission was my own work and does not contain, to the best of my ability and belief, any material previously published or written by another person or material that has been significantly accepted for the award of any other degree or diploma from the university or any other institute of higher education, except where due recognition has been given in the letter.



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APPROVAL LETTER

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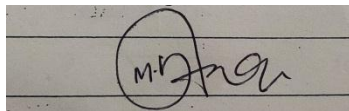
Subject: Approval of Project Report of B.Sc. In TE

Dear Sir,

I am humbly writing to tell you that this project report titled as "**Study on Quality Assessment of Children Clothing in Bangladesh**" has been set up by the under study bearing **ID 163-23-4820** is finished for definite assessment. The entire report is prepared in the light of the best possible examination by **TÜV SÜD Bangladesh (Pvt.) Ltd.** Furthermore, the intrusion completed the basic examination of the observational information with the required possessions.

This will therefore be highly appreciated if you kindly accept this project report and consider it for final evaluation.

Yours Sincerely



Dr. Md. Mahbubul Haque

Professor & Head

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ACKNOWLEDGEMENT

There is a race of life in the current term competition in which those who had the will to come forward succeed. Research is like a bridge between theoretical and practical work. First of all, the authors express their sincere thanks to the highest authority of the Almighty God, who is clearly the One who has always guided me to work on the right route of life. Without his grace this research study could not become a reality. The authors thankful to **Dr. Md. Mahbubul Haque**, Head, Department of Textile Engineering, DIU for his generous attitude and friendly behavior and also provide us the opportunity to learn the practical knowledge through research study. The authors wish to express their deepest gratitude and special thanks to their worthy Supervisor **Dr. Md. Mahbubul Haque, (Professor& Head)**, Department of Textile Engineering, DIU, for his constant support, nonstop able guidance, spirited encouragement, positive criticism, valuable comments and proposals at every stage of this project study. He had given us enough freedom during our study, and he has continually been nice to us. The authors wish grateful to the Almighty for giving us mentor like him.

The authors like to thank to **Md. Shafiqul Islam**, Manager, Department of **Analytical Wet Lab, TÜV SÜD Bangladesh (Pvt.) Ltd**, for their sincere collaboration and enormous support during the research work. The authors would also thankful to all the lab technicians for their sincere cooperation and provided that a good atmosphere in the lab.

DEDICATION

Every difficult job needs self-indulgence and, in addition, the direction of the elders, especially the individuals who were very close to our hearts.

*Our unassuming exertion we devote to our sweet and adoring
Father & Mother,*

*Whose love, affection, help and prayers, day and night, make us
capable of such accomplishment and regard*

*Along with all dedicated and regarded
Teachers.*

ABSTRACT

Kid garments is glacially important concerning things related to kids' health for the parents at present condition in Bangladesh. For exporting any kinds of garments there have been made a significant test to meet the garments testing requirements to deliver it other countries. There is no more significant testing requirement to make a garment for both local brand and local market at Bangladesh present scenario. In the study, there has been made an implication towards the analytical health concerning issue for kid's garments to their parents. The study is basically based on quantitative performance of different test related to kids garments item among the three renewed brand and local market kids garments product and international brand product and also make a comparative chart of presence of kids hazards among them. Afterwards those selected brands are provided a clear image for awareness of kids clothing to the parents. Both selected brand of local market and local brand have been shown the higher hazards value towards P^H for both before wash and after wash. The strength of red purple to violet color is higher value of 1+, 2+, 3+ indicating the presence of formaldehyde in terms of before wash and after wash for both local market and local brand kid's apparel. The more color distorted after washing on their different testing requirements. In survey analysis, 80% parents actually don't face any problems associated with kid's skin. They said that they used those apparel after washing of them. But in the study after washing apparel behavior are no changed as well. Thus, some toxic chemicals are imposed on the apparels. It's almost 20% (fig-5.2) parents faced skin diseases by kid's apparel. Most of the parents think positive about the term kid's apparel safety. They will be benefited if any tag is used in the kid's apparel that focuses the kid's apparel are for their children. However, I observed in the contest of kids clothing testing after accessing some statistical data from 100 parents individually. Thus, Finding the maximum people don't aware about the term toxicity in kids apparel in the ratio of 65% (don't aware), 25% (Moderate) & 10% (Highly aware) between (UTTARA Residential area along with Rajuk shopping complex & Jamuna future park Dhaka). However, although the aware parents are washed their apparel after purchase, but it has higher value of and pH formaldehyde after wash the apparels. Finding no changed the pH value and formaldehyde after and before wash in the study respectively.

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CHAPTER- 01

INTRODUCTION

1.1 Introduction

Designers and manufacturers intend to guide product developers for the risk assessment process through a series of safety gateways to ensure however that safety is fully integrated into fresh products at the earliest possible point probably of a goods life cycle. By identifying and significantly eliminating potential safety hazards during the design and approval processes of the sample / prototype, the risk structure is poor. Children and babies are the most impacted by chemical dermatitis because their skin is vulnerable because their immune systems are not fully formed to combat skin irritants. Formaldehyde-based anti-crease resins are used on fabrics that are treated to withstand wrinkles. Preventing colors that are the primary element of many colors in most commercial AZO-based chemicals and are therefore likely to contaminate a big amount of textiles. In stretchy products such as spandex, latex and rubber were discovered. Depending on the stage of skin sensitivity or the duration the fabric is worn, skin rashes will occur after wearing clothing containing these substances. Rashes will occur within hours for some people, while for others it may take days to see the symptoms. Because these regions have more delicate skin, trap heat and sweat than other parts of the body, rashes will usually occur in regions likely to be thighs, armpits, groin region, elbow crook, knee back or neck. The study has been resembled three different brand and made a comparison among local market, local brand and international brand with their respective kids' garments quality. However, collecting data through survey questionnaires in the different shopping complex that is intended to collect data from Jamuna Future Park shopping complex, Dhaka and Rajuk shopping complex, which reflects two populations region. The study would be able to solve the problems associated with kid's apparel quality and their parent's awareness for the children health hazards. Significantly, at the present concerning issue for the parents could be made them as an aware personality towards kid's fashion by the study.

1.2 Aims of Project

Evaluating the testing report for kid's apparel through different parameters, the study would be able to make realization among the parents towards their kid's clothing. The main goal of the research study is to help the parents to justify their kid's apparel by seeing some health concerning issue and testing priority that is attached on the clothing. The parents easily identify

which product will be safe for their children health for both local market & local brand kid's apparel respectively.

1.3 Main Objective of Study

- To know the present scenario of kid's apparel quality in Bangladesh for both local market and local brand respectively.
- To identify different children health hazards that was being done through kid's apparel.
- To evaluate the different test related to kid's apparel.
- To make comparison among highly aware people, moderate aware people, not aware people.
- To suggest some future study for the children apparel quality.

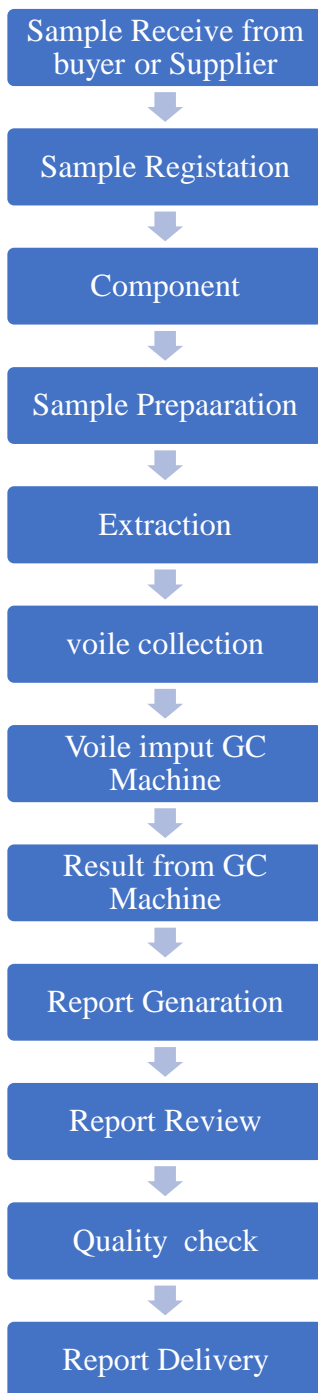
CHAPTER-02

LITERATURE REVIEW

2.1 Literature Review

Basically, no potential work has been done before regarding the quality of children clothing. In the context of materials and industrialized environmental sustainability valuation, some relevant work has been done based on performing eco-friendly tests for the product's base materials. In terms of quality assessment of children in Bangladesh, some relevant important test has been done that is related to eco-friendly test for the environmental sustainability evaluation. Formaldehyde and P^H value test have been done for assessing the toxic hazards in the kid's apparel. But mentioning the method in the previous research, it is very uncertain to identify the hazards for sensitive clothing. Even at low levels, formaldehyde has allergic and sensitizing impacts. Formaldehyde levels of 300-mg / kg on a garment can cause allergic impacts in sensitized people. Formaldehyde affects the respiratory tract and mucous membranes at levels above 0.5 mg / m³ of air. Using a chromotropic acid technique to evaluate the formaldehyde presence of the child's clothing, the outcome can be readily recognized with the intensity of the purple ring graded from 1 + to 3 + and reassessed after clothing and washing. But the result of ppm unit isn't provided the actual result for assessing hazards chemicals using in the context of kid's apparel. The major limitations of the previous work are that the study have no potential survey report indicating the eco-friendly sustainability concern towards the peoples. But the provided study has been done fruitfully about the people awareness and some sustainability viewpoints of their kid's clothing quality by the making 100 parent's individual data survey. But the study has some important points which may be focused future more and likely to be resolved. Kid's clothing isn't just enough in fabric testing that was accessed by different parameters in the study. But kid's clothing may be related their other accessories to some extent buttons, zipper, rivets, pompons, metal trims, buckle and so on which isn't tested in the context of kid's clothing quality.

2.2 Process Flow Chart of Laboratory Section



2.3 Negative Impact of Chemicals (Kid's Apparel)

Table: 2. 1 List of negative impact of chemicals (kid's apparel)

Sl.no	Chemicals	Potential harm
1	P ^H Value	Skin irritation
2	Formaldehyde	Skin irritant. Mucous membrane irritant. Potential carcinogen. Children who may have been exposed to formaldehyde for an extend period of time will likely develop asthma or other similar medical conditions.
3	Chromium & Chromium Vi	Skin irritant. Potential carcinogen
4	Nickel	Skin irritations.

2.4 Quality

Quality assurance and quality control (QA/QC) are two different activities that are part of quality management. QA is focused on the process used to measure and provide confidence that quality requirements will be fulfilled, thereby preventing defects. Examples of QA activities include the examination and coordination of production documents and manufacturing supervision. QC is the process that ensures that the quality requirements are indeed met by identifying and correcting defects. This includes the inspection of semi-finished products before and after processing. Watch our video to learn more about quality assurance in international investment projects and how we can help you to tackle the related challenges

2.5 Importance of Quality

New build plant projects are always expected to be completed in a timely and cost-effective manner while complying with national and international regulations and requirements. Having a good quality management programmer minimizes defects and enables smooth transition through all phases of the project. In addition, ensuring the quality of structures, components, equipment

and systems in a plant may improve its operability, availability, reliability, and maintainability throughout the rest of its lifetime.

2.6 Quality Control

From the design stage, we ensure that your components are compliant with relevant standards and requirements. Our experts can conduct tests on components at your suppliers' site and recommend any adjustments required during the manufacturing process to ensure that they can meet your specifications, timeline and budget. We also certify your components according to PED 2014/68 / EU, ensuring market access when required. With our global multidisciplinary pool of experts which include welding engineers, welding technicians and inspectors experienced with the requirements of the chemical and pharmaceutical industries, we will be able to support you in over 1,000 locations worldwide.

2.7 Objective of Quality Control

TÜV SÜD promotes customers in the development of secure, high-quality water crops and networks according to their particular technical and performance demands. Our specialists provide QA / QC services throughout the entire value chain, from early planning to operational start-up to maintenance. We guarantee that water infrastructure is safe, secure, practical, reliable, cost-effective and consistent by promoting sound planning, smooth construction and sustainable activities.

2.8 Third-Party Technical Advisory Services

TÜV SÜD supports customers with evidence of idea, demand evaluation and supply network analysis from the early planning phases. Our specialists provide state-of - the-art technology information facilities and evaluate whether it is suitable for use. We also create individual alternatives based on the requirements of user requirements (USR), taking into consideration future renewable energy sources and energy-efficient solutions.

2.9 Manufacturing Supervision and Quality management

- Support for investment projects under application
- National / international regulations
- Examination of request specifications and documents
- Advisory on structural design
- Testing scopes for special materials
- Individual report on special materials
- Approvals, tests and certifications according to PED 2014/68 / EU
- Expert activities

2.10 Technical Quality Assurance (TQS)

- Advice on the selection of semi-finished products, apparatus and pipe manufacturers
- Support in the preparation of requested documents
- Technical examination of offers and participation in tenders
- Auditing of manufacturers and suppliers
- Pre-inspection meetings before the start of production
- Manufacturing-related tests at the manufacturer and on construction sites
- Assessment non-destructive test results
- Quality assurance of enameled components
- Testing of surface quality
- Factory Acceptance Tests (FAT), Site Acceptance Tests (SAT), Inspection Release Certificate (IRC)
- Tests according to customer specification of components for pharmaceutical equipment
- Testing of fittings, housings, pumps, etc.
- Positive Material Identification(PMI)
- Video endoscopy
- Ultrasonic wall thickness measurement
- Airborne sound measurement on machines
- Measurement and evaluation of vibrations on machines
- Tests of stirrer drives
- Expediting
- Shipping control
- Checking of manufacturer's documentation
- Inspection release

2.11 WELDING TECHNOLOGY

- Training and testing of welding personnel
- Monitoring of welders and extension of exams
- Personnel certification according to PED 2014/68 / EU
- Welding technical drawing test
- Welding monitoring
- Certification of procedural tests
- Acceptance of working tests
- Manual dexterity tests
- Welding expert reports in case of damage

2.12 IMPORTANT OF STANDARD DEVELOPMENT

Common terminology is provided by standards and certification. Without this, the evaluation and comparison of products is hard, leaving no common ground for innovation. Furthermore, without norms, guidelines and technical specifications that guarantee quality, security and reliability, customers are more likely to continue to use current products than to try new ones.

2.13 TÜV SÜD Helps To Ensure Quality of Your Products, Processes and Services

TUV SUD is an autonomous testing and certification partner for third parties with years of participation in the water sector. Our TUV SUD brand is associated with worldwide quality and safety. We provide testing equipment and have comprehensive experience in creating suitable product, process and service test program and criteria catalogs. Our water specialists are prepared to assist you with a thorough knowledge of the industry's complicated requirements.

2.14 Standard Development of Involve

TUV SUD advises on the creation of norms, guidelines and technical specifications for water and hygiene goods, procedures and services. We also create TUV SUD certificates for fresh products and certify products according to these certificates.

2.14.1 ADVISORY

We offer consulting services to assist our customers create norms, guidelines and technical specifications for textile products, procedures and services.

2.14.2 Development of Tüv-Süd Certificates

An in-depth gap analysis is performed on the basis of screening of appropriate norms and a thorough assessment of the particular criteria. As a next step, current standards can be either adjusted to particular demands or extra criteria and test processes can be implemented to ensure the quality of the product. The TUV SUD certificate is created after this strict inner process.

2.14.3 Testing and Certification

TUV SUD certifies products in accordance with certificates created by TUV SUD. This can be done in one of our own testing equipment or in an internal certified laboratory.

CHAPTER -03

METHODOLOGY

3.1 Materials

To test the kid's garments for accessing their quality, the study has been taken three different brand mentioning local market, local brand and international brand. All the brand is selected according to the knitted (S/J) garments (100% cotton fabric) with different configuration and different color also. Kids apparel are selected with age range between 5-6 years due to most of the health hazards are occurred in these ages respectively. The local market kids' apparel is collected from the walkway area of Rajuk shopping complex, the local brand garments are collected from infinity and shoishob brand respectively and MC & George are the respective international brand are selected for accessing the quality of kid's apparel.

3.2 Material List

INTERNAL WORK SHEET - TEXTILES					
SERVICE : Regular (Chemical)					
Report No. : BD/T(G)/19/022956					
Material List / List of Materials (As Identified By Laboratory)					
Component Nc	Component Description with Color	Material	Weight(gm)	Colours	Remarks
Garment	-				
A1	Red Rubber Print With Sea Moss Body Fabric	Natural			
A2	White Rubber Print With Sea Moss Body Fabric	Natural			
A3	Grey Rubber Print With Sea Moss Body Fabric	Natural			
A4	Black Rubber Print With Sea Moss Body Fabric	Natural			Azo Test Exempted Due To Weight<0.2 gm
A5	Sea Moss Rib Fabric At Neck/Sleeve/Bottom	Natural			
A6	Sea Moss Neck Tape	Natural			

Weight of the product(gm) :

Figure 3.1: material list of buyer

3.3 Test Requirements of Buyer

GARMENTS, SCARVES, CAPS, GLOVES AND RELATED

Products containing	Textile			Leather	Others						
	Textile: natural fibres/ Regenerated cellulose fibre (eg. Viscose)	Textile: synthetic fibres	Textile: blend fibres with Synthetic Fibers		Ceramic & Glass	Coated / prints	Plastic	Rubber	PU/TPU	Metal parts / jewellery	Packaging Materials
APFOs/ APs	●	●	●	●		●			○		
Allergenic and 'other' dyes	●	●	●	●		○					
Azo dyes	●	●	●	●		●			●		○
Carcinogenic dyes	○	○	○	○		○					○
Chlorinated Organic Carriers		●	●								
DMFu (Dimethylfumarate)				●			○	○	○		○
DMFa (Dimethyl formamide)				○					○		○
Extractable heavy metals ⁵	○	○	○	○		○				●	○ ⁶
Formaldehyde	●	●	●	●		○			○		○
Isocyanates						○			○		
Ni Release ¹										●	
Organotin compounds	○	○	○	○		○	●	○	●		○
PAHs ⁴			○	○		●	○	●	○		
Pesticides	○		○	○							
Phenols	○		○	○		○					
Phthalates							●	●	●		○
pH value ²	●	●	●	●		●			●		
Perfluorinated Compounds (PFCs) ³						●					
Flame Retardant ⁷	○	○	○	○			○	○	○		○
PVC						●	●	●			

Products containing	Textile			Leather	Others						
	Textile: natural fibres/ Regenerated cellulose fibre (eg. Viscose)	Textile: synthetic fibres	Textile: blend fibres with Synthetic Fibers		Ceramic & Glass	Coated / prints	Plastic	Rubber	PU/TPU	Metal parts / jewellery	Packaging Materials
SCCP				●		○	○	○	○		○
TCMTB				○							
Total Arsenic	○		○							○	
Total Cadmium						○	○	○	○	○	
Chromium VI with Aging				●							
Total Lead					●	○	○	○	○	○	○
Total Mercury	○		○				○	○	○	○	
Bisphenol A (BPA)							○	○	○		
VOCs ⁴				○		○		○			

● Required testing for each product type on styles in Testing Programmes.
○ Indicates chemicals for each product that should be tested occasionally (additions will be selected by sourcing office/brand CR responsible or on supplier initiative).

Notes
 1. Test applicable for materials with direct skin contact, spot test on metal parts should be performed by the lab – if this is indicating the presence of nickel then the lab will automatically go to the full extractable nickel test.
 2. pH test is applicable on materials with direct and prolonged skin contact.
 3. Perfluorinated Compounds test is mandatory for water and oil repellent finishing or coating only.
 4. Usually clear smell is the key indicator for PAHs and VOCs. For EVA materials especially Acetophenone and 2-Phenyl-2-propanol are relevant (limit 10mg/kg). PAHs is mandatory if Materials direct to skin contact.
 5. Test applicable on metal with direct and prolonged skin contact.
 6. For Packaging it will Total Heavy metal as per 94/62/EC.
 7. Flame Retardant test will be applicable if product treated by Flame retardant Chemicals.

Figure3. 1 Test Requirements of Buyer

3.4 Chemical Testing Method (Kid's Apparel)

The chemical testing has been comprised into several parts which is important for kid's apparel testing as well. The study used random sampling technique in terms of different chemicals testing.

3.4.1 P^H Value Test

The acid and alkaline content stayed in apparel fabrics is tested with PH value. Apparel fabrics that can contact the skin directly have a greater pH-value requirement. If regulated between weak acid or neutrality, the pH value does not make the skin itchy. To prevent the excessive pH value, fabric providers should emphasize the method of printing and dyeing. Export-oriented clothing companies should focus on product quality during production and strictly monitor fabric inspection to ensure the quality of the clothing to meet safety, sanitation and environmental protection requirements.

3.4.2 Test Method (AATCC 81-2006)

- This test method used to determine the pH of wet processed textiles.
- To make a quantitative determination, the chemicals which influence pH must be removed from the textile specimen and then collected as a water extract which is used to accurately measure by a pH meter

3.4.3 Specimen Preparation & Test Procedure

- For the test using 10 g specimen, cut into small pieces. Then boiling 250 ml distilled water for 10 minutes, immerse the specimen, cover the beaker with a watch glass and boil for an additional 10 minutes. Allow the covered beaker and contents to cool down to room temperature.
- Finally determine the pH of the extract using a pH meter



Figure3. 2 P^H Meter

- Range of pH scale: 0-14
- P^H = 7 equates pure water and / or neutral solutions pH < 7 equates a solution with acid impacts
- P^H > 7 equates a solution with basic impacts

AATCC 81-2006 pH Test

Method: Standard


Number: AATCC 81-2006


Title: Textiles Determination of pH of aqueous extract

Language: Simplified Chinese or English Publication

Date: 2009/6/11

3.4.4 Test Result: P^H Value

Sample No.	BD/T(G)/19/022837-A 	Equipment Name	
TestMethod	ISO 3071-2005/ GB/T 7573-2009	Buyer	

Test Code : 
BD/T(G)/19/022837-A-10

TestResult : pH Value

		A4
Average	-	
Result	1	
Result	2	

Limit of Quantification :

Conclusion :

Figure3. 3 Test Result of P^H (3.4.4)

3.5 Formaldehyde Test

Disperse-coloring and formaldehyde resins are the most common causes of textile dermatitis. Formaldehyde resins are called continuous resins and have been used on textiles since the 1920s to give wrinkle resistance to 100% cotton and cotton / polyester mixing textiles. Children are concerned about contact with allergy to clothing containing formaldehyde. A easy technique for detecting formaldehyde in textiles is the chromotropic acid technique. This research was conducted to detect formaldehyde in textiles using the chromotropic acid technique and to evaluate the impact of washing on the content of formaldehyde.

Test Method

Chromotropic acid test method

3.5.1 Specimen Preparation & Test Procedure

Both branded samples of cloth were cut into 1 square cm piece and cooked in a test tube (1st test tube) in 5 ml of distilled water. A few crystals of chromotropic acid were added in another test tube (2nd test tube) to 2 ml of 72 percent concentrated sulfuric acid. The 1st test tube's cooled supernatant was added to the 2nd test tube and heated the combination over a flame. A red to violet color suggested a favorable test (i.e. the presence of formaldehyde in textiles), whereas its lack stated that there was no formaldehyde in the cloth sample. Red violet to violet color intensity was classified as 1 +, 2 + or 3 + (Figure 3.3). After washing, clothes that showed formaldehyde were reassessed. For 5 minutes the textile samples were rinsed with detergent and water and dried with soap afterwards. They were re-evaluated for formaldehyde after drying. After each wash, red purple to violet color intensity was observed. A reduce in red to violet intensity after washing indicated a reduction in formaldehyde content.

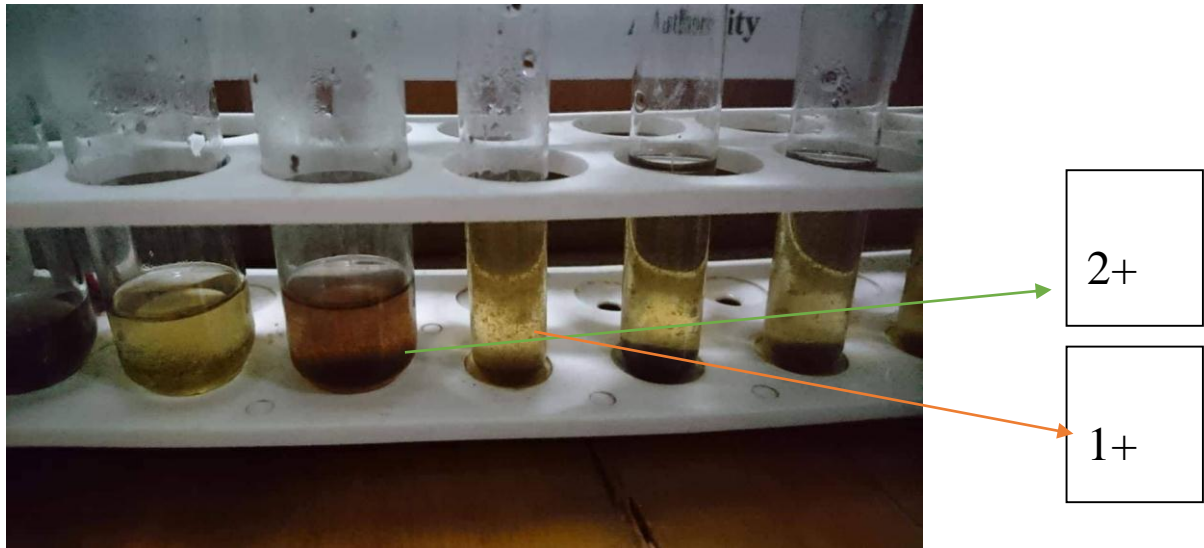




Figure3. 4Formaldehyde testing from TUV SUD Testing Lab



Figure 1: Red purple to violet color indicating presence of formaldehyde

Figure3. 5Red purple to violet color indicating presence of formaldehyde

Test Result: Formaldehyde

Sample No.	BD/T(G)/19/022837-A 	Equipment Name	
TestMethod	Based on ISO 14184-1 : 2011/ GB/T 2912.1	Buyer	
Test Code :	 BD/T(G)/19/022837-A-9		

TestResult : Formaldehyde Content

Analytes	CAS No.	A3
Formaldehyde	50-00-0	

Limit of Quantification :
Conclusion :

Figure3. 6 Formaldehyde

3.6 Saliva Test

To determine the resistance of the color of textiles to saliva

3.6.1 Test Method

GB/T 18886

3.6.2 Equipment

- Per spirometer
- 11 acrylic-resin or glass plates
- Flat-bottomed dishes

- Oven, maintained at $(37\pm 2)^{\circ}$ C
- Light box with light source D65
- Grey scale for assessing change in color (ISO 105-A02)
- Grey scale for assessing staining (ISO 105-A03)
- Multifibre adjacent fabric, type DW (ISO 105-F10)
- Chemicals for the saliva solution (see preparation of solution)
- Distilled water, grade 3
- Scale

3.6.3 Preparation of Solution

Saliva solution, freshly prepared, containing per liter distilled water:

3.0g Lactic acid ($\text{CH}_3\cdot\text{CH}(\text{OH})\cdot\text{COOH}$)

0.2g Carbamide ($\text{H}_2\text{N}\cdot\text{CO}\cdot\text{NH}_2$)

4.5g Sodium Chloride (NaCl)

0.3g Potassium Chloride (KCl)

0.3g Sodium Sulphate (Na_2SO_4)

0.4g Ammonium Chloride (NH_4Cl)

No need to bring the saliva solution to specific P^{H} .

3.6.4 Test Specimen

Use of two samples of 4 cm x 10 cm for each color and material. It is also necessary to test labels, badges and drawstrings. Make sure all color is tested if the item is multi-colored. If the item is printed, striped or contains several colors, more sample specimens may be needed. If details (including prints) are contrasting in colour, these must be screened against both multi-fiber adjoining fabric and the fabric to which the detail is connected. They only need to be tested against multi-fiber neighboring fabric if not in contrast colour.

3.6.5 Test Procedure

- 4 Firstly, cut specimens measuring 4 cm x 10 cm.
- 5 Attach a specimen to multi-fiber adjacent fabric of the same size, by sewing along one of the shorter (4 cm) sides. The multi-fiber adjacent fabric should be next to the face side of the fabric.
- 6 Switch on the oven and preheat pre-heat per spirometer & acrylic plates for 30 min.

- 7 Place the specimens in a dish with 100 ml of the sweat solutions and thoroughly with the help of glass rod/acrylic plate to wet specimen and multi-fiber for 30 min.
- 8 Pour off the excess solutions from specimen by using wringer /glass.
- 9 Place each specimen between two glass or acrylic plates and place them in the per-spirometer. Each per-spirometer can hold maximum 10 samples. If less, all 11 plates still have to be placed in the per-spirometer. Put a pressure of 12.5 kPa on per spirometer using the load, lock it and then remove the load. 12.5 kpa pressures must be evenly distributed on the sample surface. Plates must be parallel to each other, inclination of plates due to thick and thin (uneven sample surface) surface must be avoided.
- 10 Place the per-spirometer in the oven for 4 hours at (37 ± 2) °C in upright position.
- 11 Take out the specimens from the oven and per-spirometer. Open out each specimen and dry them in room temperature, not exceeding 60°C, with the specimen only being in contact at the point of the stitching.

3.7 Copper Test

3.7.1 Test Method

Qualitative spot test (AATCC)

3.7.2 Specimen Preparation and Test Procedure

Spot the ash of the sample with 5–10 drops of 10% nitric acid. Add diluted ammonia until the ash is alkaline. A blue color shows the presence of copper. The test may be performed on fabric directly using 0.1% sodium diethyl dithiocarbamate solution after the above-mentioned procedures. A brown color shows the presence of copper. However, iron may interfere to generate a brown color too.



Figure3. 7 Copper Test

Evaluating the Project

The following observing points are mentioned.

- Level of toxicity used in kids' apparel.
- Problems associated with skin regarding kids' apparel.
- Test certification on toxicity of kid's apparel for both local market and local brand.
- Satisfactions with kids brand regarding their quality.
- Importance of kid's garments testing for both local market and local brand kids apparel product.
- Comparing no test label of kid's apparel with test label kids' apparel.
- Necessity of garments safety for children health.

Satisfactions with kids apparel price for both local market and local brand kid's apparel product. All the chemical tests are being done by Analytical Wet Lab of TÜV SÜD Bangladesh (Pvt.) Ltd.

CHAPTER4

RESULT & DISCUSSION

4.1 Result and Discussion

In this study, I have been done by determine the quality of kid's apparel and make awareness to the children's parents. Both local market and local brand kid's apparel shows a greater impact on kids clothing at the present condition of Bangladesh rather than international brand. The study shows more than higher formaldehyde and heavy metals in the kid's apparel for both local market and local brand.

4.2 Chemical Testing of Kid's Apparel

4.2.1 P^H value Test

The P^H value of an aqueous extract of the textile article is determined according to AATCC 81-2006. The required P^H range corresponds approximately to the natural P^H value of human skin (approximately 5.5). This avoids skin irritation due to the release of acidic or alkaline substances from damp textiles. The P^H maximum limit for safe textile materials especially for kid's is 6–8. However, the tested average pH value at before wash results for various branded kid's apparel were 8.4, 8.1 and 7.3 for local market, local brand and international brand kid's apparel respectively. In the study, there has been made a significant progress in case international brand who shows more limit value at before rather than others brand whereas two sample of both local market and local brand kid's apparel show the higher P^H value which directly affect skin irritation for kid's health. Results are shown in Table 5.1. pH value at after wash actually no changed. It's clearly shows that sometimes kid's skins are affected after washing of apparel.

- Basically P^H normal range for Baby item **6-8** (It's depends on buyer)

Local Market			Local Brand			International Brand		
Sample code	Before wash	After wash	Infinity			George (Walmart)		
			Sample code	Before wash	After wash	Sample code	Before wash	After wash
LM 1	8.3	7.8	LBI 1	8	7.5	IMG 1	7.5	8.4
LM 2	8.5	8.2	LBI 2	7.8	8.6	IMG 2	7.5	8.4
			Shoishob			MC (Mother Care)		
			LBS 1	7.9	8.4	IBM 1	8.1	8.2
			LBS 2	8.8	8.5	IBM 2	8.1	7.8

Table: 4. 1 Test Result

4.3 Formaldehyde Test

Formaldehyde has allergenic and sensitizing effects, even at low concentrations. Levels of 300-mg/kg formaldehyde on a garment can trigger allergic effects in sensitized individuals. Formaldehyde has an irritant effect on the respiratory tract and mucous membranes in concentrations above 0.5 mg/m³ air. A red purple to violet color indicated a positive test (i.e. the presence of formaldehyde in textiles), while its absence indicated that the cloth sample did not contain formaldehyde. The intensity of red purple to violet color was graded as 1+ (lower intensity), 2+ (Medium intensity), or 3+ (Higher intensity). The intensity of red purple to violet color was noted after each wash and before wash. A decrease in the intensity of red purple to violet color indicated a decrease in the formaldehyde content after washing. In this study, the intensity of red purple to violet color are higher for both local market and local brand kid's apparel rather than international brand for both before and after wash. Test method followed for formaldehyde is the chromo tropic acid method (clothing). Before and after washing of apparels are no changed for formaldehyde testing. However, it's clearly shows that sometimes kid's skin is affected after washing of apparel.

Standard value

- Japan law No 112 : 20ppm -75ppm
- European Union ECO- label : 30ppm- 75ppm
- EU restriction on the use of dangerous chemical : 30ppm- 100ppm

Local Market			Local Brand			International Brand		
Sample code	Before wash	After wash	Infinity			George (Wal-Mart)		
			Sample code	Before wash	After wash	Sample code	Before wash	After wash
LM 1	1+	1+	LBI 1	1+	1+	IMG 1	Not present	Not present
LM 2	2+	1+	LBI 2	1+	1+	IMG 2	1+	Not present
			Shoishob			MC (Mother Care)		
			LBS 1	1+	1+	IBM 1	1+	1+
			LBS 2	1+	1+	IBM 2	1+	1+

Table: 4. 2 Formaldehyde report -1

4.4 Saliva Test

In the study, two sample of local market kid's apparel showed more color bleeding rather than others and one of them sample is more effety affected by the acrylic fiber and another one is affected by wool fiber and thus causes higher color bleeding towards wool fiber. In case of local branded kid's apparel, both infinity and shoishob branded kids apparel causes higher color bleeding towards wool fiber after washing of them accordingly. But in case of international branded kid's apparel wouldn't cause any change after washing of those apparels & no change occur with the value of 5. Results are shown in Table 5.3. In terms of color changing phenomenon for accessing the color changed evaluation through grey scale, both two samples of local market kid's apparel have been showed significant changes in color after washing of those apparels. Similarly, Infinity and Shoishob also changes in color significantly after washing. But in case of international branded kid's apparel shows no change in color after washing of apparels. Results are also shown in below.

Standard value: Change in colour (of the test specimen):

- Grey scale is used for checking the change in colour of the specimen
- This scale consists of nine parts (from 5-1)

	Local Market						Local Brand						International Brand								
	D	C	N	P	A	W	Infinity						George (Walmart)								
								D	C	N	P	A	W		D	C	N	P	A	W	
L M- 1	5	5	5	5	4	5	LB I-1	5	5	5	5	5	4/5	IB G- 1	5	5	5	5	5	5	5
L M- 2	5	5	5	5	5	4/ 5	LB I-2	5	5	5	5	5	5	IB G- 2	5	5	5	5	5	5	5
							Shoishob						MC (Mother Care)								
							LB S- 1	5	5	5	5	5	5	IB M -1	5	5	5	5	5	5	5
							LB S- 2	5	5	5	5	5	4/5	IB M -2	5	5	5	5	5	5	5

Table: 4. 3 Saliva test value at different brand

Local Market		Local Brand		International Brand	
LM 1	4/5	Infinity		George (Walmart)	
LM 2	4/5	LBI 1	4/5	IBG 1	5
		LBI 2	5	IBG 2	5
		Shoishob		MC (Mother Care)	
		LBS 1	5	IBM 1	5
		LBS 2	4/5	IBM 2	5

Table: 4. 4 Saliva test value at different brand – Color Change

Where, D=Di-acetate, C-cotton (Bleached), N=Nylon, P=Polyester, A=Acrylic, W=Wool

4.5 Copper Test

In the study, the presence of brown color indicates copper detection in the provided sample. Majority of the sample for both local brand and local market kid's apparel found the copper rather than international brand. Test method followed for copper test is the qualitative spot test (AATCC) method.

Heavy metals	Baby wear	With skin contact	Without skin contact	Accessories
Antimony (Sb)	30.0	30.0	30.0	—
Arsenic (As)	0.2	1.0	1.0	1.0
Lead (Pb)	0.2	1.0	1.0	1.0
Cadmium (Cd)	0.1	0.1	0.1	0.1
Chromium (Cr)	1.0	2.0	2.0	2.0
Cobalt (Co)	1.0	4.0	4.0	4.0
Copper (Cu)	25.0	50.0	50.0	50.0
Nickel (Ni)	1.0	4.0	4.0	4.0
Mercury (Hg)	0.02	0.02	0.02	0.02

Local Market		Local Brand		International Brand	
LM 1	Present	Infinity		George (Walmart)	
LM 2	Present	LBI 1	Present	IBG 1	Not present
		LBI 2	Not present	IBG 2	Not present
		Shoishob		MC (Mother Care)	
		LBS 1	Not present	IBM 1	Not present
		LBS 2	Present	IBM 2	Not present

Table: 4. 5 Copper test value at different brand

Here,

LM= Local Market

LBI= Local Brand Infinity

LBS= Local Brand Shoishob

IBG= International Brand George

IBM= International Brand MC

4.6 Evaluating the survey Question

The offline survey would make more helpful data to create awareness among the parents rather than online survey. The following observing points are mentioned in the survey.

1. Level of toxicity used in kids' apparel.
2. Problems associated with skin regarding kids' apparel.
3. Test certification on toxicity of kids apparel for both local market and local brand.
4. Satisfactions with kids brand regarding their quality.
5. Importance of kid's garments testing for both local market and local brand kids apparel product.
6. Comparing no test label of kids apparel with test label kids' apparel.
7. Necessity of garments safety for children health.
8. Satisfactions with kids apparel price for both local market and local brand kids apparel product

4.7 Data Analysis after Survey

The parent's awareness in context of using toxicity in kid's apparel assessed during survey period. In the study, the comparison made with awareness of using toxicity in kid's apparel in the terms of eight different questionnaires and individual parents' points of view according to the different questionnaires.

4.7.1 Data analysis on awareness about the term toxicity in kid's apparel

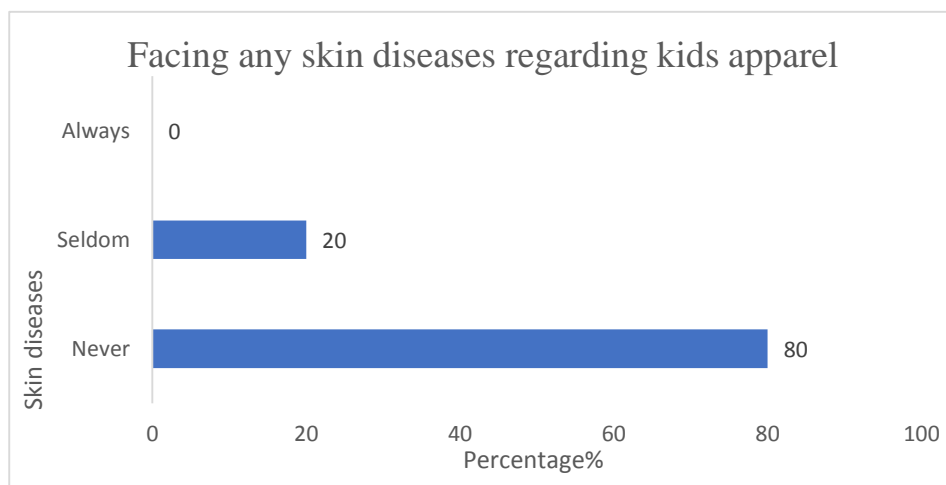


Figure4. 1: Data analysis on awareness about the term toxicity in Kid's apparel

4.7.2 Data analysis on awareness about the term toxicity in kid's apparel

In survey analysis, 80% parents actually don't face any problems associated with kid's skin. They said that they used those apparel after washing of them. But in the study after washing apparel behavior are no changed as well. Thus, some toxic chemicals are imposed on the apparels. It's almost 20% (fig-5.2) parents faced skin diseases by kid's apparel.

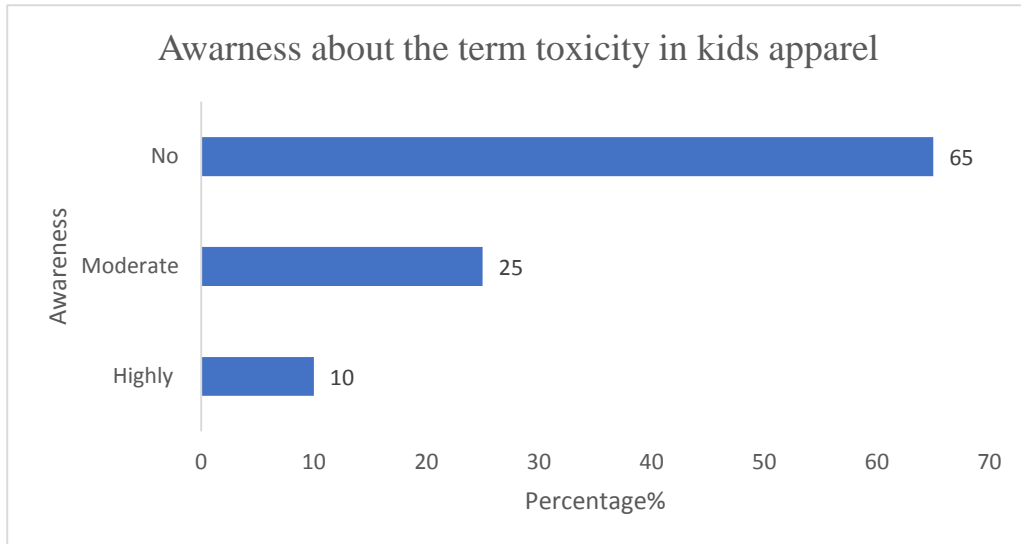


Figure4. 2: Data analysis on awareness about the term toxicity in Kid's apparel

4.7.3 Data analysis on test certification on toxicity of kid's apparel

Approximately 90% (fig-5.3) parents are thinks so about the term test certification on the present local brand in Bangladesh.

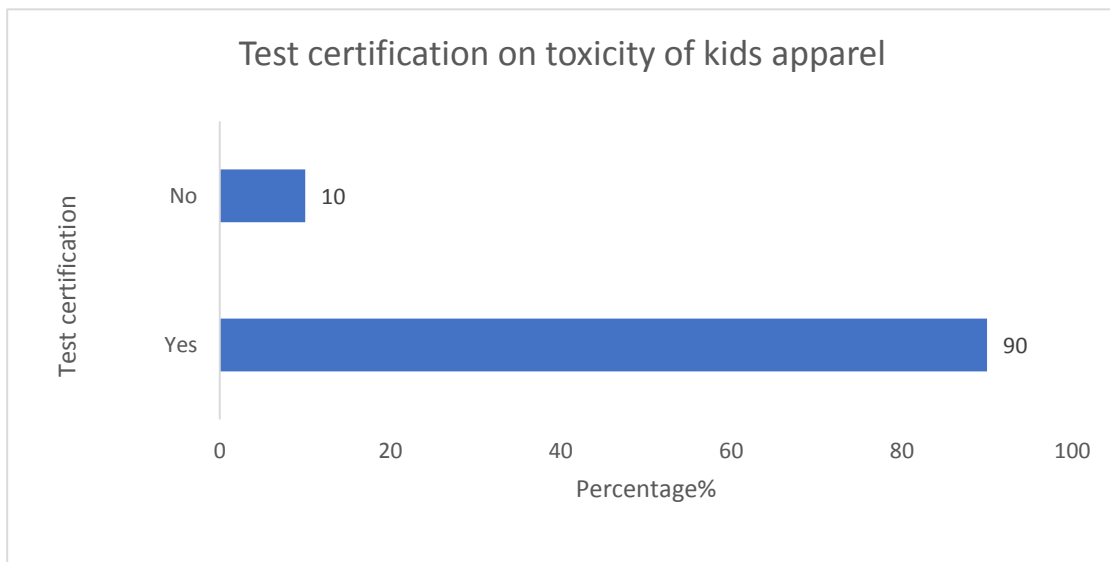


Figure4. 3: Data analysis on test certification toxicity in Kid's apparel

4.7.4 Data analysis on satisfaction of kid's brand quality

The more than 50% parents satisfy their kid's brand quality sometimes. But they don't feel so happy regarding quality of apparel.

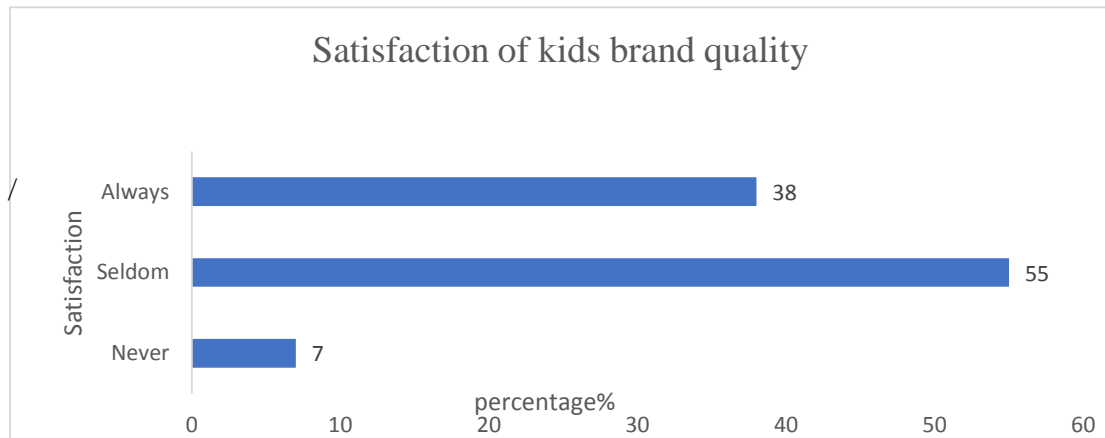


Figure4. 4: Data analysis on satisfaction of Kid's brand quality

4.7.5 Data analysis on importance of kid's apparel testing for local brand

The all about 96% (fig-5.5) parents think that testing priority of kid's apparel is needed for local brand as well as other apparels at the pre

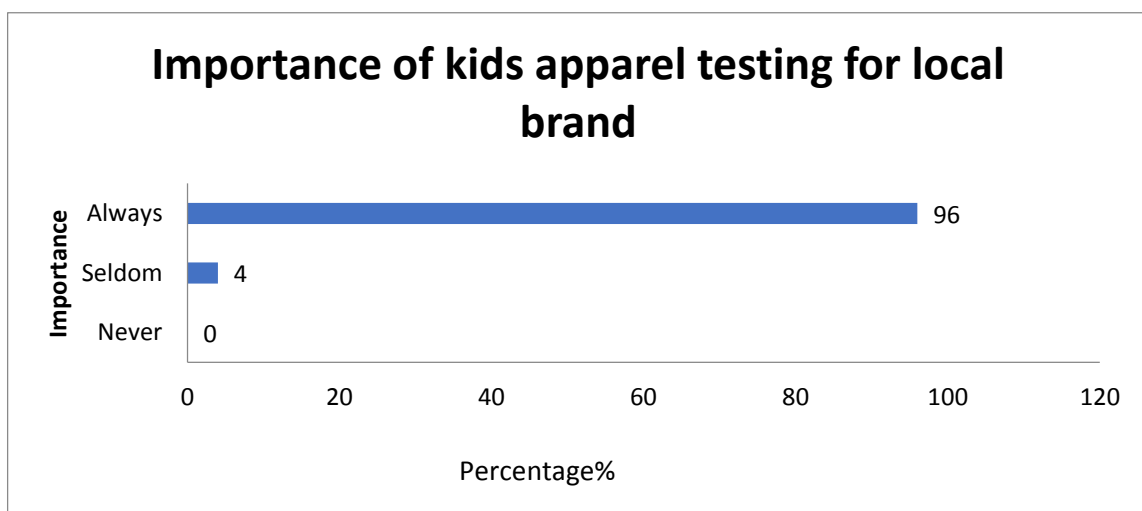


Figure4. 5: Data analysis on important of Kid's apparel testing for local brand

4.7.6 Data analysis on agree to more payment for tested product

The more than 90% (fig-5.6) parents agree to more payment for the tested product for local brand in Bangladesh. They think that it will be beneficial in future product purchasing frequently from the local brand.

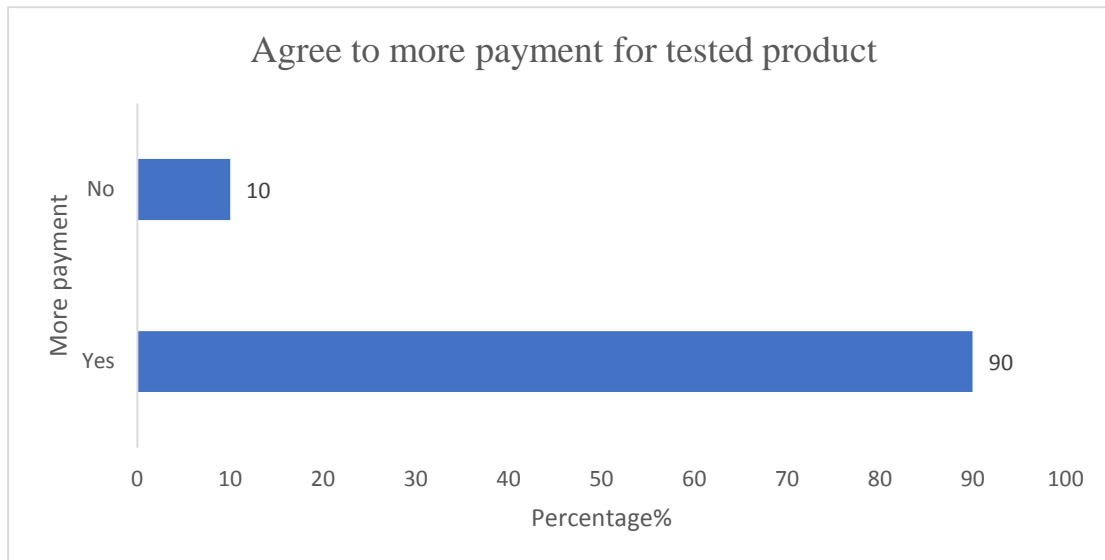


Figure4. 6: Data analysis on agree to more payment for tested product

4.7.7 Data analysis on necessity of kids apparel safety

Most of the parents think positive about the term kid's apparel safety. They will be benefited if any tag is used in the kid's apparel that focuses the kid's apparel are for their children.

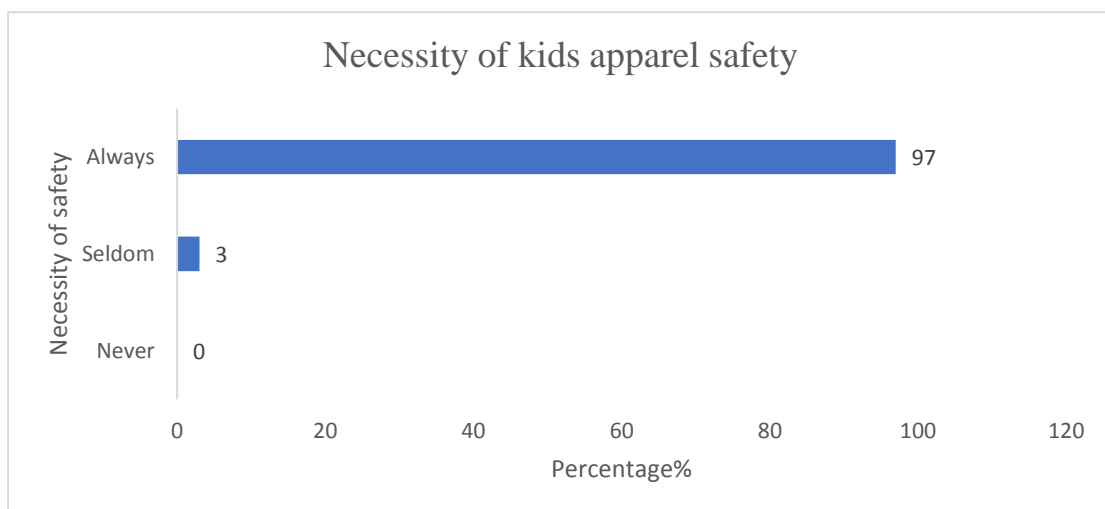


Figure4. 7: Data analysis on necessity of Kids apparel safety

4.7.8 Data analysis on satisfaction on the price of local brand kid’s apparel

The more than 40% parents satisfy their kid’s brand price for local brand sometimes. But they don’t feel so happy regarding quality of apparel.

4.8 Comparison between aware parents and different questionnaires

The significant data analysis would be able to meet the challenge of the study outcomes with the help of making comparison between aware parents and different questionnaires in the three different viewpoints.

4.8.1 Comparison between highly aware parents and different questionnaires

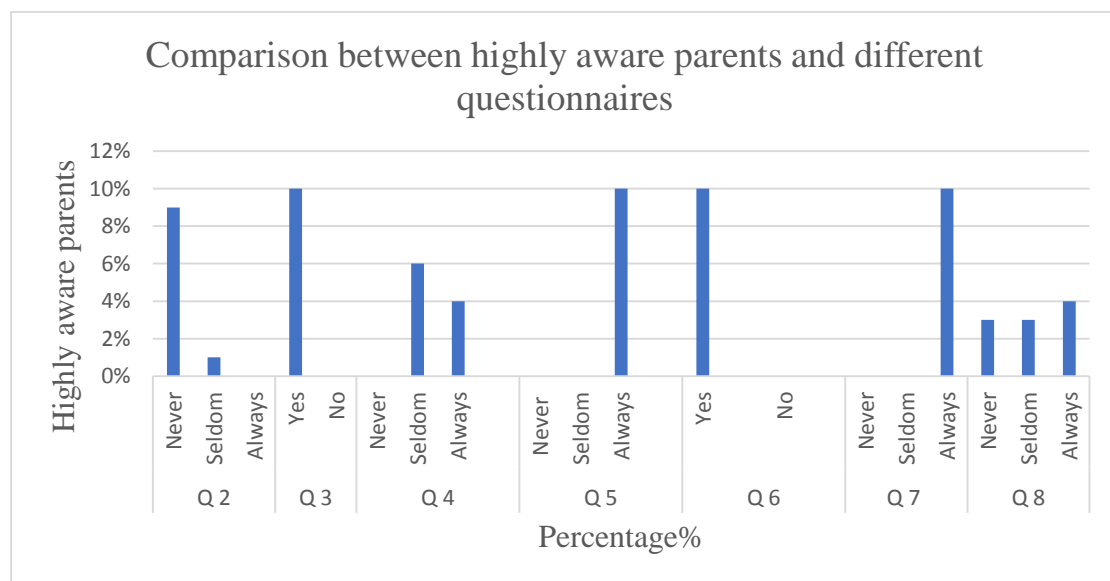


Figure4. 8: Comparison between highly aware parents and different questionnaires

4.8.2 Comparison between moderate aware parents and different questionnaires

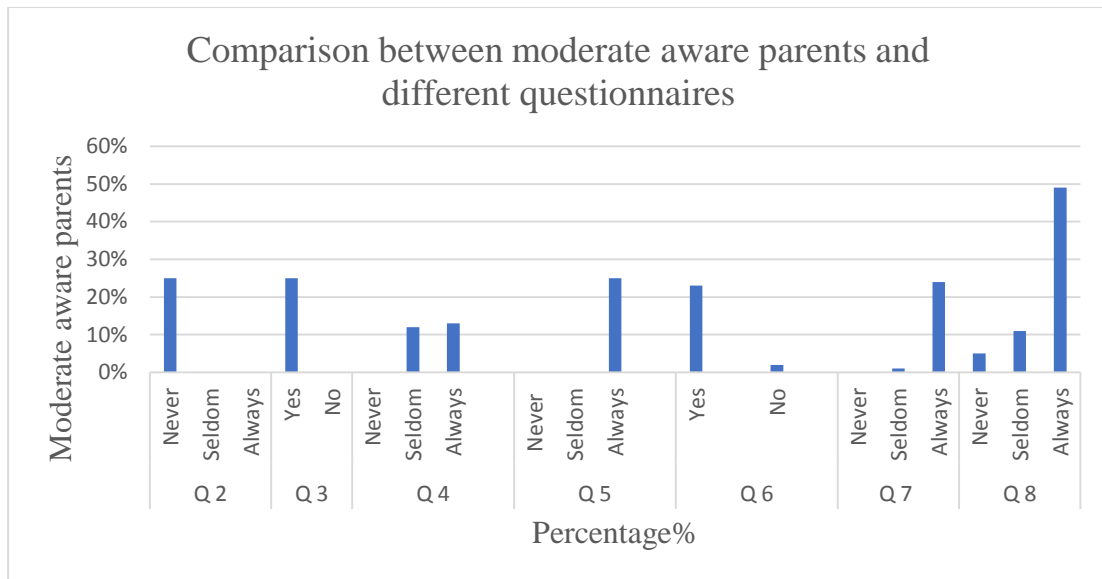


Figure4. 9: Comparison between moderate aware parents and different questionnaires

4.8.3 Comparison between not aware parents and different questionnaires

The mentioned statistical data showed the value in different viewpoints in context of kid’s apparel quality in Bangladesh. The moderate aware parents (65%) given best priority on the questions number Q1, Q2, Q4, Q5, and Q6. They think positively to improve the kid’s quality for both local market and local brand in Bangladesh as well as international brand.

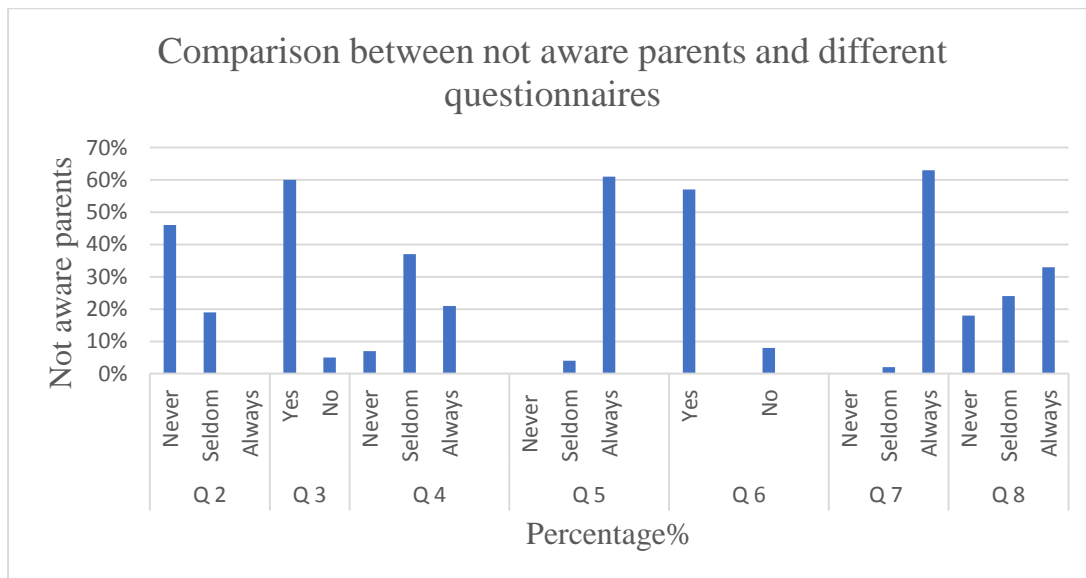


Figure4. 10: Comparison between not aware parents and different questionnaires.

CHAPTER -5

CONCLUSION

5.1 Conclusion

Although the study has some limitations regarding the quality of kid's apparel towards the parents at the present condition of Bangladesh, it creates consciousness among the parents. The following strength of the study might be improved the conscious power of the quality of kid's apparel among the parents. The study would be able to solve the problems associated with kid's apparel quality and their parent's awareness for the children health hazards. Significantly, at the present concerning issue for the parents could be made them as an aware personality towards kid's fashion by the study.