

Quantitative Analysis on Online Women Entrepreneurs in Bangladesh: COVID-19 Pandemic Effect

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Abstract

Online women entrepreneurship is crucial for driving economic growth and fostering social progress in Bangladesh, where women represent almost half of the population. When women dive into entrepreneurial ventures, they not only secure their financial stability but also help to enhance social inclusion. The appealing features of online business models—like flexibility, lower barriers to entry, and wider market access—have drawn many Bangladeshi women into this field, helping it gain traction across the nation.

However, these women entrepreneurs face several challenges that can hinder their business sustainability and growth. Some of the main hurdles include limited access to funding, lack of family and community support, varying levels of education and digital skills, labor shortages, and inefficiencies in managing operations. The COVID-19 pandemic has only worsened these issues, with nationwide lockdowns and health concerns adding extra pressure on women-led online businesses.

The paper employed a quantitative approach to identify how the socio-economic variables have shaped the content of online women entrepreneurship during the COVID-19 pandemic and analyze its phenomenon in Bangladesh.

Keywords

Women Empowerment, Online Entrepreneurship, Women Entrepreneurs, COVID-19, Social Inclusion, Financial Stability, Economic Empowerment, Quantitative Modelling

1. Introduction & Overview

1.1 Introduction

According to United Nations data 2021, the current population of Bangladesh is around 166 million, and among them, 49.4% are women [1]. Entrepreneurship is a key element of economic growth and social transformation. Bangladesh is a densely populated country with limited resources. Along with men, women can also play a significant role in improving and expanding small and medium enterprises, as well as creating new business opportunities in e-commerce or the online sector. So, it is important to empower women through entrepreneurship to achieve economic and social development. Women's empowerment through entrepreneurship can be a pathway to reduce gender inequality as well as create new job opportunities.

According to the E-Commerce Association of Bangladesh (e-CAB), there are 2000 e-commerce websites and 100,000 Social media e-commerce communities [2]. Bangladesh's largest software service association has around 300,000 members, roughly half of whom are women, who run their businesses with the help of Facebook. These are signs of a promising future for women's empowerment through online business in Bangladesh.

Online women entrepreneurship is kind of a recent phenomenon in Bangladesh. The online business of Bangladesh is mostly small in terms of size, as these are in the start-up stage. The online women's entrepreneurship may possess some unique characteristics that encourage women to enter this field, but they also face many restrictions while running the business. Among them, the main constraint is access to finance. Most women entrepreneurs start their business by financing themselves, or they might be forced to enter the business through a partnership to finance their business. Lack of family support might be another constraint faced by online women-led business owners. The recent ongoing COVID-19 pandemic might also pose some negative externalities for women to continue to run their businesses.

COVID-19 Pandemic associated with nationwide lockdown and health hazard risks, which might impose a threat on the development of women-led online businesses in Bangladesh, especially in terms of production and operation management. The paper aims to use a quantitative method for analyzing the main features of online female-led businesses and how the COVID-19 pandemic affects the overall operation and decision-making process of online women entrepreneurship in Bangladesh.

1.2 Research Objectives

The main research objective is to analyze the COVID-19 impact on the sustainability of businesses run by online women entrepreneurs in Bangladesh. The other research objectives are given below:

- a) To illustrate the process of women's empowerment through entrepreneurship in Bangladesh.
- b) To identify the characteristics of online women entrepreneurs in Bangladesh.
- c) To identify constraints for women entrepreneurs in the online sector of Bangladesh.
- d) To analyze the changes in access to network of women entrepreneurs via technology and their decision making behavioral due to COVID-19 pandemic.

1.3 Research Methodology

Quantitative analysis using the existing sample survey data of a study collected from the 'Brac Institute of Governance and Development' to identify the impact of the COVID-19 Pandemic on online women entrepreneurs in Bangladesh. The survey data consists of two rounds, which were collected during the nationwide lockdown and restrictions imposed by the government in Bangladesh. So, the study mainly focused on the behavior and challenges faced by online women entrepreneurs in Bangladesh during the pandemic restrictions. Using the analytical software like 'Microsoft Excel', the study tries to show the characteristics of online women entrepreneurs and through regression analysis using the software 'STATA', the paper is going to explore how the COVID-19 pandemic affects online women entrepreneurs in Bangladesh in terms of production and operation management of the business. For analyses, we included items of each survey that theoretically may have reflected domains of online women's entrepreneurship.

1.4 Empirical Model

The statistical analysis proposed for this study is a regression analysis to identify how the independent variable has shaped the content of online women entrepreneurship during the COVID-19 pandemic and to analyze this phenomenon.

In this research, the dependent variable is 'Revenue', which indicates the earnings of online women entrepreneurs from their business

The independent variables are as follows:

- **COVID:** This is a variable that reflects online women entrepreneurs' financial condition during the pandemic
- **Occupation:** This is a categorical variable with six variables: surveyed business, home maker, professional jobs, services, student, and other business
- **Education:** This is a categorical variable with three variables: school passing/studying, graduate degree/studying, post-grad degree/studying
- **Age of business:** This is a numerical variable measured by the number of weeks the business has been operating
- **Types of products:** This is a categorical variable with seven categories: clothing, accessories, food, home décor, stationery/books, gift products, cosmetics
- **Number of employees:** This is a numerical variable where different businesses hired different number of employees
- **Mode of delivery:** There are mainly 3 categories: pick up, personal delivery, third party delivery. Some of the business, choose more than one category to deliver their product.

The general form of the model examined can be stated as:

$$\text{Revenue} = \beta_0 + \beta_1 \text{covid} + \beta_2 \text{Occupation_ respondent owner} + \beta_3 \text{Education_ respondent owner} + \beta_4 \text{Age_ business} + \beta_5 \text{Type_ Products} + \beta_6 \text{Number_ employees} + \beta_7 \text{Mode of delivery} + \epsilon_i$$

1.5 Limitation of the Study

- Time constraints limited the depth and breadth of the research process.
- Inaccessibility of relevant data posed challenges to comprehensive analysis.
- Lack of access to necessary documents or reports hindered a full review of existing literature.
- Privacy concerns led many online women entrepreneurs to withhold personal experiences and business-related information during data collection.
- Data were collected through a third-party online survey, whose primary research interest differed slightly from the focus of this study.
- Possible data errors may exist due to respondents misunderstanding questions or choosing not to respond due to a lack of interest.
- Use of closed-ended survey questions may have limited the depth of insights and reduced the validity of some responses.
- Small sample size limits the generalizability of the findings; results may differ with a larger sample.

2. Literature Review

Entrepreneurship has long been recognized as a catalyst for economic development, innovation, and social transformation. Kirzner (1997) highlights that entrepreneurs serve as decision-makers within specific cultural contexts [3], while Schumpeter (1911) conceptualizes entrepreneurship as occurring under five conditions of novelty: new goods, new production methods, new markets, new sources of materials, and new organizational structures [4]. These foundational theories provide a broad lens through which the role of women entrepreneurs, particularly in the online domain, can be examined.

In the context of women's entrepreneurship, Das (2000) identifies three key influencing factors: antecedent influences (such as familial and genetic factors), incubator organizations (the professional environments where women develop entrepreneurial interests), and socio-economic conditions (including access to capital and support networks) [5]. These factors remain relevant in both developed and developing nations, including South and East Asian countries. Scholars such as Raju (2000) and Sinha (2003) further categorize women entrepreneurs in Asia into three groups: "chance" entrepreneurs who enter the field unexpectedly, "forced" entrepreneurs driven by necessity, and "created" entrepreneurs who deliberately pursue business opportunities [6,7].

According to UNDP (2004), a woman entrepreneur is one who, individually or in partnership, initiates or inherits a business, willingly assumes financial and managerial risks, and engages in daily operations [8].

Female entrepreneurship first gained scholarly attention over three decades ago and has since expanded significantly [9]. The Global Entrepreneurship Monitor (GEM) estimates that over 231 million women are currently engaged in entrepreneurial ventures across 59 countries [10]. Despite entrepreneurship often being framed through a masculine lens, many scholars argue that it also represents a powerful mode of women's empowerment [11]. Cohoon, Wadhwa, and Mitchell (2010) identify five major motivators for women entrepreneurs: the desire to build wealth, a passion to pursue personal ideas, the appeal of startup culture, a long-standing dream of business ownership, and dissatisfaction with traditional employment [12].

Women's entrepreneurship not only provides pathways to economic independence but also contributes to job creation and family well-being [13]. Braun (2011) notes that women's economic participation improves their social status within the family and community [14]. Kepler and Shane (2007) observe that women-owned enterprises tend to minimize risk, aiming for a balance between personal and professional lives [15]. Women entrepreneurs are often driven by push factors, such as economic need and family responsibility [16,17]. Additionally, studies have shown that women entrepreneurs are highly educated, technologically adept, and essential to sustainable economic recovery [18,19]. Many female-led ICT and tech-enabled businesses have proven competitive even in global markets [20]. Information and communication technology (ICT) has become a critical enabler for female entrepreneurs, offering enhanced access to markets and networks [21]. The proliferation of web technologies, including social media platforms like Facebook, Instagram, and Twitter, has provided cost-effective and accessible avenues for women to launch and expand their businesses [22]. Digital technologies continue to transform entrepreneurial ecosystems and facilitate the entry of marginalized groups, including women, into business [23-26]. Online platforms, in particular, are emerging as inclusive spaces for women-led ventures [27-29].

Nevertheless, challenges persist. Women entrepreneurs often face structural and societal barriers, such as restricted access to finance, traditional gender roles, limited human capital, and insufficient networking opportunities [30,31]. These issues are even more pronounced in the online business environment, where visibility and scalability depend heavily on digital literacy and capital.

The vulnerability of women-led businesses became especially evident during the COVID-19 pandemic. Research suggests that such businesses, often younger, smaller, and concentrated in more volatile sectors, were disproportionately affected by economic disruptions [32-34]. Women entrepreneurs also faced increased domestic responsibilities due to the closure of schools and childcare services [35]. According to O'Sullivan (2021), the effects of pandemics linger beyond the initial health crisis, impacting economic behavior and social structures [36]. Audretsch et al. (2021b) and Torrès et al. (2021b) argue that COVID-19 inflicted significant psychological and financial stress on entrepreneurs, many of whom faced severe operational shocks [37,38]. The Cherie Blair Foundation for Women (2020) reported that 26% of female-led businesses with a Facebook presence became inactive during the pandemic, with women's enterprises 5.9% more likely to close than those led by men [39]. Additional research points to liquidity crises, business shutdowns, and persistent gender disparities in support mechanisms and funding access [40-42].

In the Bangladeshi context, women constitute nearly half of the population, yet many remain marginalized, with limited access to education, nutrition, and employment [43]. With restricted job opportunities, self-employment through entrepreneurship has become increasingly important for Bangladeshi women. Despite structural barriers, a growing number of women have entered the entrepreneurial space and achieved notable success, particularly in online ventures.

Khanum et al. (2020) note that Bangladeshi women entrepreneurs have broken social and cultural barriers to contribute to the national economy [44]. Haque and Quader (2014) explored the use of Facebook as a business platform in Dhaka and found that online bakeries run by women have become a common entrepreneurial venture [45]. Similarly, Chowdhury and Alam (2013) found that women in Bangladesh are increasingly aware of their rights and are willing to

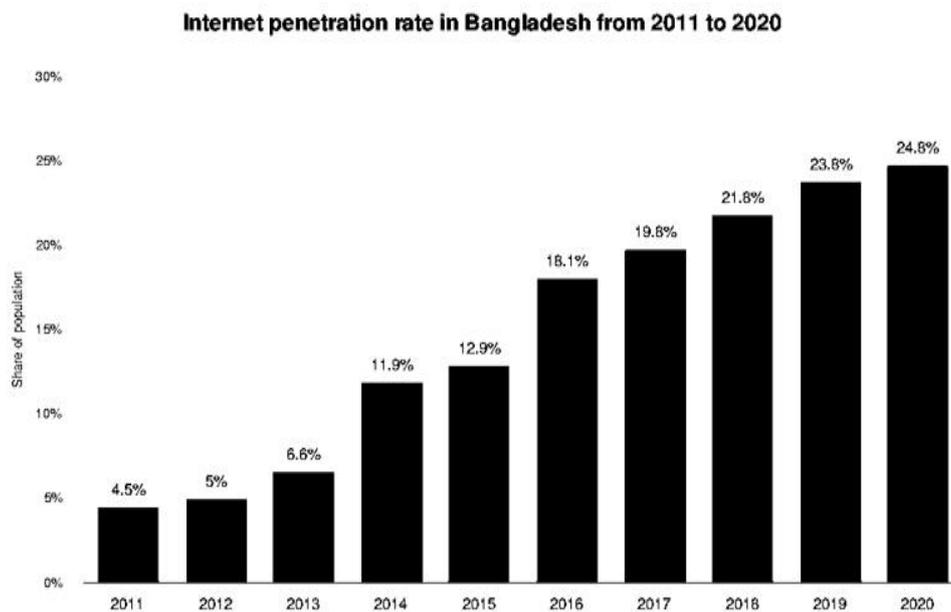
challenge norms to establish businesses [46]. Afroze et al. (2014) identified personal traits—such as diligence, managerial skills, and family support—as key success factors for Bangladeshi women entrepreneurs [47].

The COVID-19 pandemic, however, severely impacted women-led businesses in Bangladesh. Hossain (2020) reports widespread financial distress and concern over business continuity [48]. Khan and Newaz (2020) surveyed small and medium-sized enterprises and found that over 50% of respondents feared permanent closure if lockdowns extended beyond four months [49].

3. Development of Online Women Entrepreneurship in Bangladesh

The emergence of women entrepreneurship in Bangladesh began in the 1990s and gained significant momentum in the early 2000s [50]. It is estimated that nearly 90% of women entrepreneurs entered the business landscape between 1990 and 2000. This rapid increase can be attributed to the transition toward a market-oriented economy and the implementation of a private sector-led development strategy, which created a more favorable environment for entrepreneurial activity. Afrin et al. (2008) emphasized that the development of women's entrepreneurship in Bangladesh is strongly influenced by women's financial management capabilities and their collective identity, particularly within lending and support groups [51]. Additionally, the attitudes of women towards business operations and management play a vital role in ensuring their sustainability in the competitive market environment. The digital transformation that enabled e-commerce in South Asian developing countries began around 2004, particularly through the expansion of small and medium-sized enterprises (SMEs) [52]. Bangladesh entered the e-commerce landscape shortly thereafter, driven by a significant rise in internet subscribers and growing public interest in digital technologies [53]. The rapid proliferation of high-speed internet and widespread mobile internet access have played a pivotal role in accelerating the growth of online businesses.

This digital shift has opened new pathways for women entrepreneurs in Bangladesh, enabling them to engage in online business activities from flexible environments such as their homes. The low entry barriers of online platforms, combined with access to social media and digital payment systems, have empowered a new generation of women entrepreneurs to launch and scale their ventures. As a result, the online business sector has become a transformative force in the economic inclusion and empowerment of women in Bangladesh. The figure below illustrates the internet penetration rate in Bangladesh:



Source. Statista Website (2022)

Figure 1. Information on Internet Penetration in Bangladesh

The figure shows that in the year of 2011, the percentage of internet users in Bangladesh was 4.5% and it became 24.8% in 2020. The percentage of internet users in Bangladesh increased almost six times over a decade. The figure also illustrates that from 2011, the number of internet users in Bangladesh has increased rapidly every year over the past decade. The Internet plays a vital role in online business as e-commerce or online business considers the internet users as their potential clients; hence, people of Bangladesh become interested in starting their own business on the online platform, especially women.

In Bangladesh, the government and private sector have taken several policies to develop the online business sector. They invested in developing the MFS like bKash to make the payment system easier for online business customers [54]. Currently, 15 banks are providing MFS, with 36.75 million active MFS accounts. Mobile banking systems like bKash

are one of the fastest-growing service providers and have succeeded in grabbing the attention of people in a short period. Bkash reports that 22% of adult population of the country became its customers in 2013 [55]. In addition, the government started a new digital financial service, “Nagad” in 2019, which is partly owned by the Bangladesh Post Office (BPO). The government has also taken some initiatives, including a distinct tax policy, a tax incentive, and a gift tax, etc. which is part of the National Action Plan (NAP) for the advancement of women leaders. The government also launched the DBID system for e-commerce businesses in the country in the year of 2022 for all kinds of online business entities like websites, Facebook pages, and apps to register their business legally [56]. This system helps online entrepreneurs to get access of TINs and bank loans and helps in the reduction of irregularities and forgery in the online business sector. Consequently, an online business would earn credibility among customers.

Bangladesh Bank has also developed massive measures to strengthen women, e.g., authorizing a loan with a 9% rate of interest [57]. Various business and government sectors, as well as NGOs such as MIDAS, provide support and advice to online business owners. Basic Bank is commonly known as a special bank, was established with the sole purpose of providing finance to small and cottage businesses. The role of organizations like BSCIC, which provides medium and long-term loans to small industries, either directly or through a consortium of commercial banks. It also aids in all other matters relating to development, expansion of small businesses, and has encouraged women's entrepreneurship development in Bangladesh [same as 57].

Different private and government organizations also organize different events like fairs, seminars, etc., across the country to promote online business among people. E.g., BPO and e-CAB jointly organized a day-long E-commerce fair at Sylhet city of Bangladesh in April 2009 to promote online platforms and business. They provided an opportunity for online business owners to exhibit their products and organize three seminars to build the network between entrepreneurs, consumers, and investors through this event [58]. Facebook-based platform Women and E-commerce Trust, widely known as WE, started its journey with just 10 women in 2017 and now has around 12 lac members. It held a two-day exhibition in the capital city of Bangladesh in March 2022 to promote online women entrepreneurs and boost their sales during the pandemic [59]. These types of events encourage more women to open their businesses on online platforms, open new doors of knowledge, and create more networking opportunities for budding online women entrepreneurs across the country.

4. COVID-19 Pandemic Effect in Bangladesh

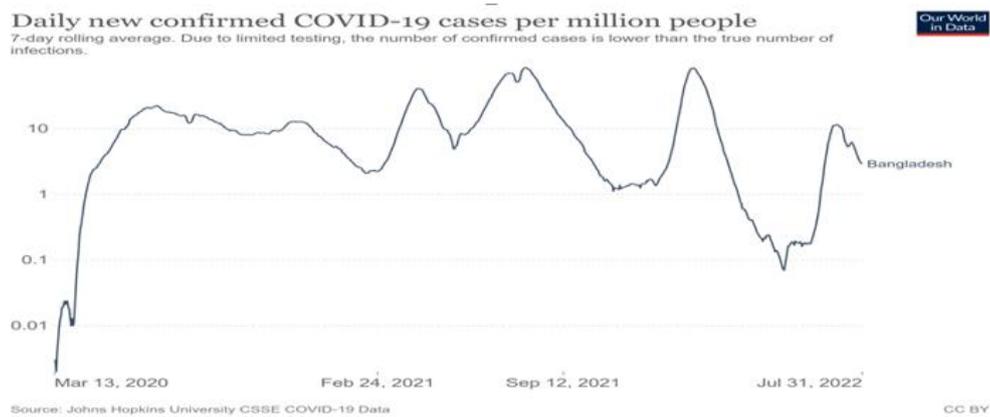
In the year 2003, the SARS-COV virus was spread by a bat in Guangdong, China. This virus infected more than 8000 people, and 776 died. A decade later (2012), another virus known as MERS-COV was detected by Saudi Arabian nationals. This virus infected more than 2428 people, and 838 people died. The two-virus confirmed as a member of the Beta-coronavirus subgroup [60]. In 2019, a huge outbreak happens with this coronavirus, or COVID-19 pandemic across the globe, and it also spread in countries like Bangladesh.

The COVID-19 pandemic has triggered an unexpected crisis that has changed the order of daily life and the business world in Bangladesh. The virus started to spread across Bangladesh in March 2020. On 8 March 2020, the first three confirmed cases were reported by the country's epidemiology institute, IEDCR. Since then, the pandemic has spread day by day across the country, and the number of affected people has been rapidly increasing. Bangladesh became the second most affected country in South Asia, after India. The total number of detected coronavirus cases in Bangladesh was 2,005,606, and the death toll was 29,292 [61]. The people of Bangladesh are still suffering from this pandemic.

To protect the citizens, the government declared a "strict lockdown" throughout the nation from 26th March 2020 [62]. The army and Border Guard Bangladesh deployed across the whole nation to enforce the measures, and all offices and shops were shut, with only local food markets allowed to open for a few hours a day. After the 1st wave, the Bangladesh govt. has imposed international travel bans and started employing a gradual lockdown. Bangladesh still faced three waves of the pandemic, and the period of these waves is given below:

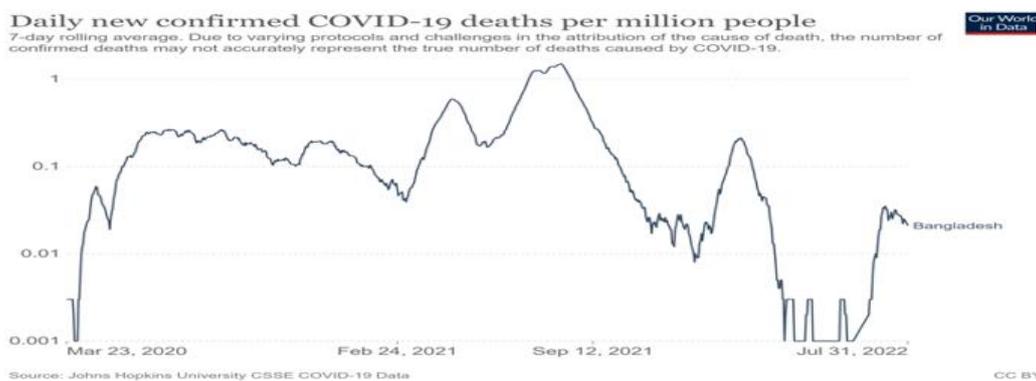
- 1st wave: March 2020 to March 2021
- 2nd wave: March 2021 to May 2021
- 3rd wave: May 2021 to present

The following figures below show the cases and fatalities in Bangladesh due to the COVID-19 pandemic:



Source: Our World in Data Website. *Note: the values are in log form.

Figure 2. Daily confirmed new cases of COVID-19 in Bangladesh



Source: Our World in Data Website. *Note: the values are in log form.

Figure 3. Daily confirmed death cases in Bangladesh due to COVID-19

Comparing Figure 2 and Figure 3, it is visible that the number of confirmed COVID-19 cases is higher than the death rate in Bangladesh. The highest number of cases and death rate was found after February 2021 and during September 2021 and still now Bangladesh is witnessing a steadily increasing rate of COVID-19 cases.

The pandemic has taken a heavy toll on almost all sectors of the economy, especially causing a reduction of exports by 16.93 percent, imports by 17 percent, and a decline of average revenue for all small and medium enterprises (SMEs) by 66 percent in 2020 compared to 2019. Also, researchers analyzed the scenario and predicted that national poverty is expected to increase by 25.13 percent in the future [63]. Many employees who are engaged in both the formal and informal sector workforce of Bangladesh are mostly affected due to the pandemic. MSMEs or backward linkage businesses of Bangladesh are greatly affected by supply chain disruption, lockdown, and factory closure. During the COVID-19 period, the domestic workload for women entrepreneurs has also increased due to the closure of schools and the higher number of sick family members needing care as the virus spread very rapidly [64]. In Bangladesh, the supply chain interruptions and low product demand have added sufferings at the very first stage of the pandemic, as female entrepreneurs rely vastly on the middleman (due to mobility challenges within the society). For women entrepreneurs, another big dilemma was the layoff decision. As most of the employees are female and all must face similar hurdles, it gradually becomes very difficult for the female business owners to decide and continue their business. During this pandemic period, repayment of existing loans has also meant greater problems for women entrepreneurs. Besides, many banks simply refuse women entrepreneurs due to the business size, which can increase banks' operational costs [65].

5. Findings & Results

a) Characteristics of online women entrepreneurs in Bangladesh:

- Ownership of the business:

In 2002, the annual UNCTAD report on E-Commerce and Development hailed e-commerce or online business as a ‘potential goldmine’ for women in developing countries due to its great potential for women’s empowerment. In Bangladesh, not all women-oriented online businesses are solely owned by women entrepreneurs due to various reasons [66]. The figure below shows the current scenario of the ownership of online women entrepreneurs in Bangladesh:

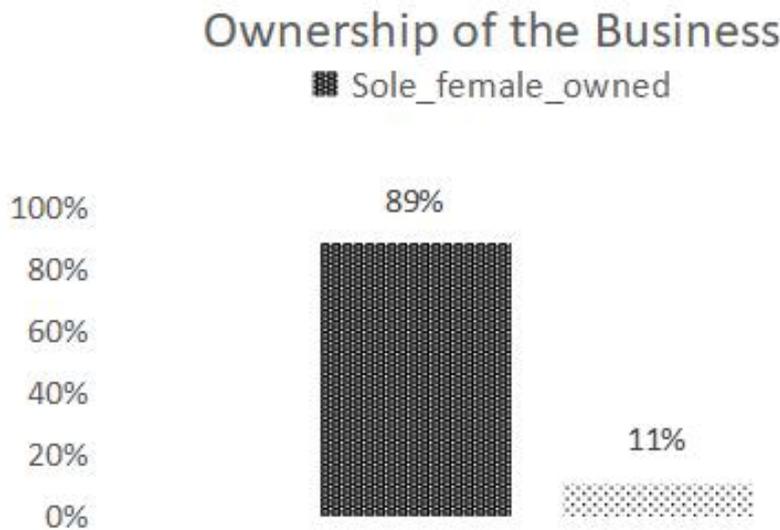


Figure 4. Ownership of the Business

According to the figure, among surveyed online businesses, 89% are solely owned by women entrepreneurs, and only 11% are women-oriented businesses where men are partners. Haque and Itohara (2009) opine that in the context of Bangladesh, women's entrepreneurship development is a challenging phenomenon because women are lagging economically and socially compared to men. Financial conditions might be one of the reasons that restrict women from becoming sole owners of businesses. Another reason could be a lack of family support or social outlooks that prevent them from obtaining sole ownership of a business.

b) Level of educational attainment of online women entrepreneurs in Bangladesh:

Education has the potential to empower women with knowledge. Education is one of the most important factors, especially for online entrepreneurs, as the business is based on the usage of technology, and without basic knowledge of technology, it is impossible to become successful. To understand the technology, it is important to be educated. Robinson and Malach (2004) suggest that the level of education is one of the success indicators for entrepreneurship and found that classroom theoretical knowledge with practical business education helps in entrepreneurship [67]. The figure below shows the educational condition of online women entrepreneurs in Bangladesh:

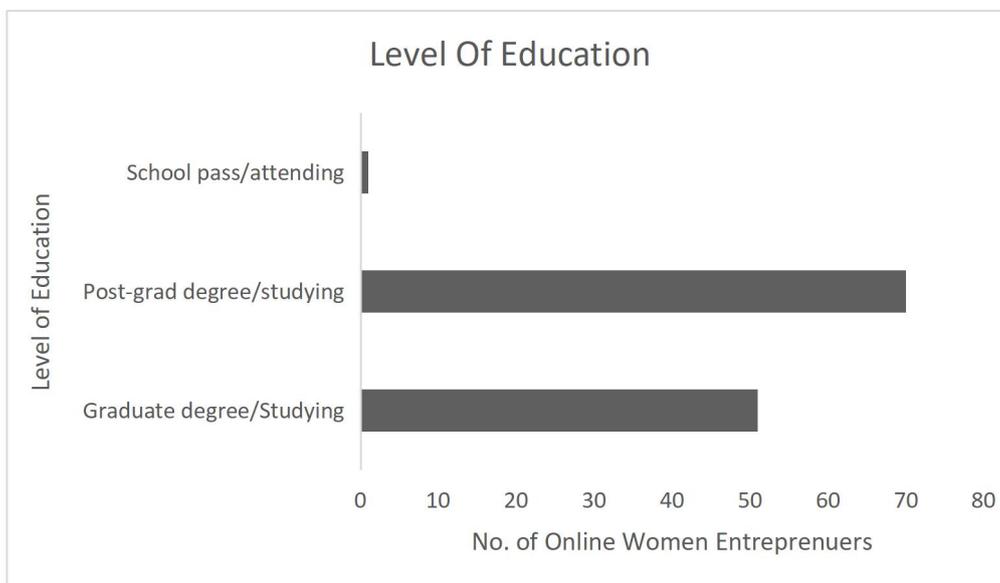


Figure 5. Level of Education

According to the figure, most of the online women entrepreneurs are involved in higher education. They have either obtained a post-graduate degree or are studying to receive a post-graduate degree, and around 50+ online women entrepreneurs are involved in studying for/received a graduate degree. Different studies suggest that a high percentage of female business owners acquired some form of occupational experience in the same sector as that of the company they created [68-72]. This might be one of the reasons for women entrepreneurs to attract toward obtaining higher education as it provides the opportunity to study entrepreneurship academically.

c) Information regarding the age of online women entrepreneurs in Bangladesh:

According to Langowitz & Minniti (2007), the most entrepreneurial age for women is between 25 and 34 years old, and it declines afterward [73]. This is especially true for women who tend to be poorer, less educated, and often have less access to new management styles, innovative methods, and technology [74]. The figure below shows information about the age of online women entrepreneurs in Bangladesh.

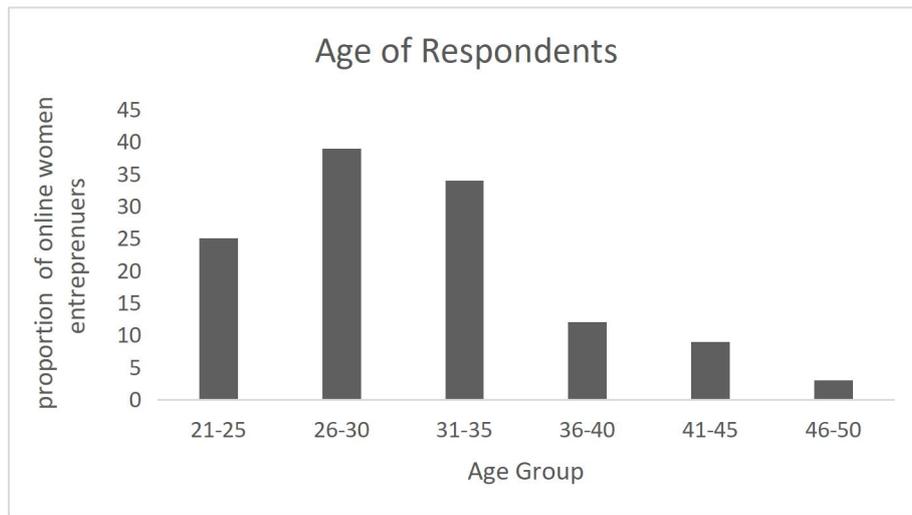


Figure 6. Age of Respondent

The figure depicts that among respondents, 39 online women entrepreneurs belong to the age group of 26-30, and 34 online women entrepreneurs of Bangladesh belong to the age group of 31-35 whereas only 9 women entrepreneurs are from 41-45, and 3 women entrepreneurs are belong to the age group of 46-50, respectively. According to DeTienne & Chandler (2007), women entrepreneurs who are aged between 25-34 years old and coupled with higher education seek more stable enterprises, become more conservative, and are not open to rapidly changing new ways of doing things [75]. This might be the reason why women of Bangladesh who are aged between 26 to 35 years old are more actively choosing to start-up businesses on online platforms.

Types of products:

Women in Bangladesh operate online businesses related to clothing, food, jewelry, fashion accessories, cosmetics, home decor items, etc. Usually, online women entrepreneurs choose a product line for business that looks vibrant and can easily attract customers, as online business customers evaluate the product by looking at pictures posted by businesses on online platforms. The figure below exhibits the types of products usually online women entrepreneurs usually sell online and the revenue earned through it:

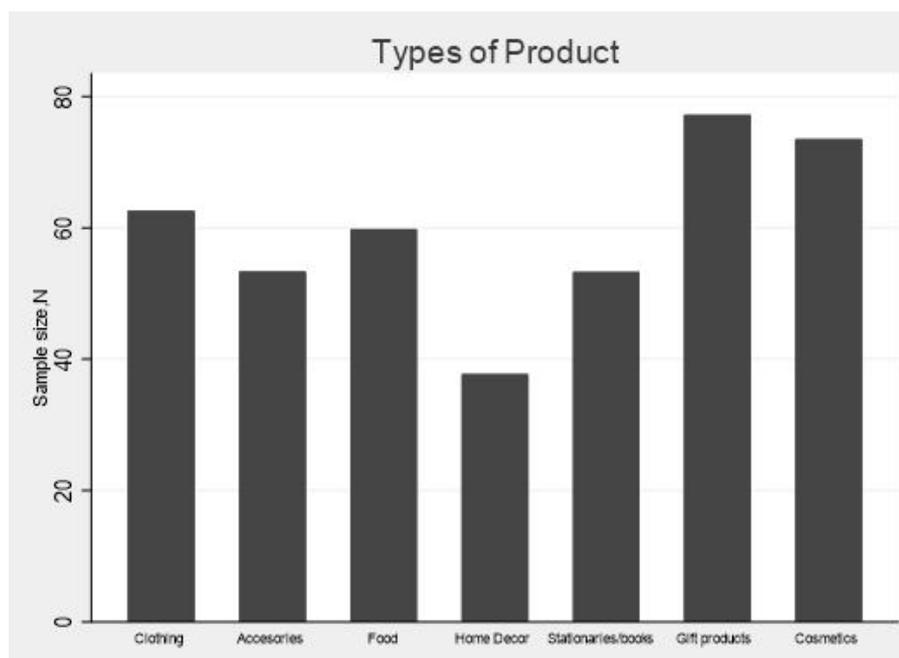


Figure 7. Types of products

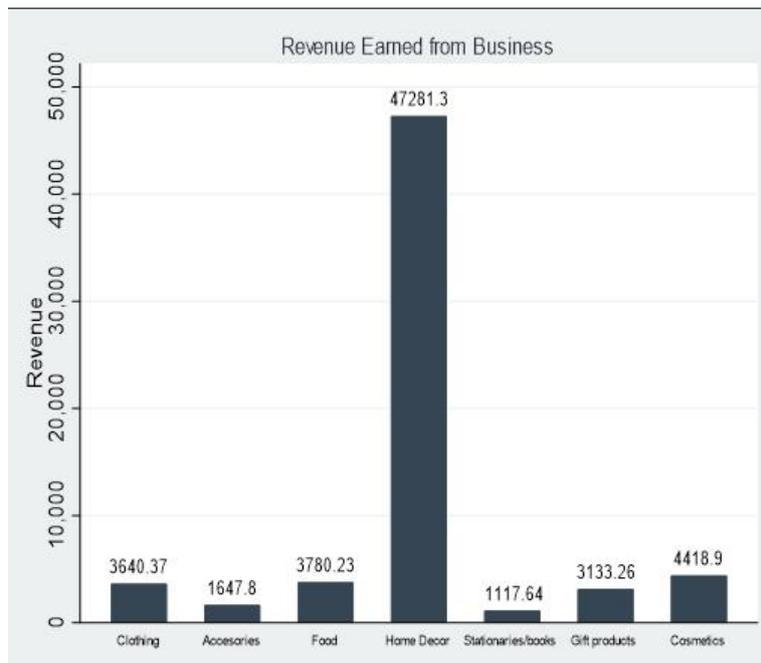


Figure 8. Revenue Earned from Business

****Note: The currency calculation is on Bangladeshi currency. The abbreviation of the currency is ‘BDT’. The figures are generated through STATA software.**

According to Figure 7, most online women entrepreneurs choose to sell products like gift items, cosmetics, and clothing, whereas few are involved in business related to home decor products. But, according to Figure 8, online women entrepreneurs who are involved in the home decor business earned the highest amount of revenue, which is around forty thousand BDT in a month, and the lowest revenue-earning business is Stationery/books (around eleven hundred seventeen BDT in a month). The gift products item business, in which most online women entrepreneurs are involved, earned around thirty-one thousand BDT in a month.

• Usage of different online platforms:

Online women entrepreneurs use different online platforms as a market where they exhibit and sell their products. In Bangladesh, online female entrepreneurs use different online platforms to showcase their products, take orders from customers, build a customer line and sell their products. The figure below illustrates the usage of different online platforms by the online women entrepreneurs in Bangladesh:

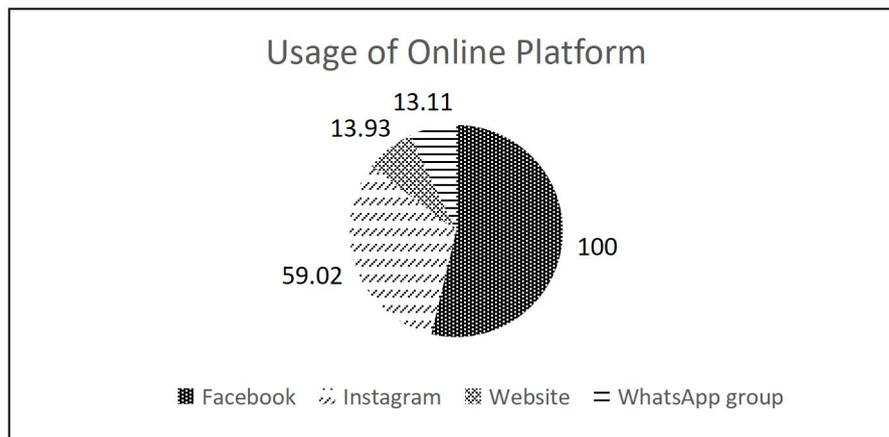


Figure 9. Usage of different online platforms

According to the pie chart, all the online women entrepreneurs use ‘Facebook’ as their main online platform to conduct their business. F-commerce is one of the newest forms of online business (e-commerce) that is quite popular among online women entrepreneurs in Bangladesh. According to a study, currently in Bangladesh, the market size of f-commerce is approximately worth Tk. 312 crore, and almost 50% of these f-commerce business owners are female [76]. The figure also reflects that around 59.02% online women entrepreneurs use ‘Instagram’, 13.93% use a website, and 13.11% use ‘WhatsApp group’ as their business platform alongside a Facebook page. These social media and online platforms play the role of a business hub for online women entrepreneurs in Bangladesh.

• **Payment Preferences of customers:**

In Bangladesh, customers used to prefer COD for payment in online business, but slowly the number of MFS users is growing in the country because MFS users feel that it is easier to use when it comes to paying for online shopping [77]. The figure below illustrates the payment options used by customers when they do online shopping in Bangladesh:

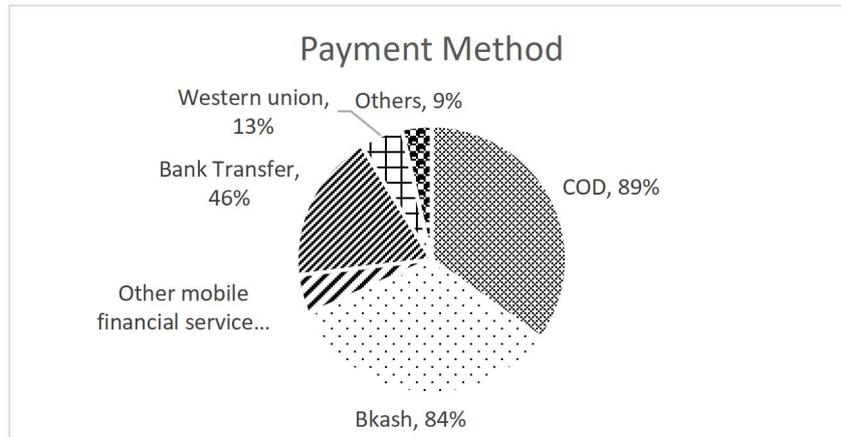


Figure 10. Customer Payment Options

The figure shows that about 89% of customers of online businesses led by women entrepreneurs prefer the COD system, but customers have also started to favor MFS services. One of the most popular MFS in Bangladesh is Bkash. Bkash operates under the jurisdiction of the Bangladesh Central Bank as a subsidiary of BRAC Bank, a local bank in Bangladesh [78]. There are also other MFS options available in Bangladesh. Customers also prefer to pay via bank money transfer, which accounts for 46% of the total, according to the figure. A customer might choose different payment options based on convenience or the options provided by the business owners.

• **Information on the financial condition of online women entrepreneurs’ families:**

According to researchers, work and family are intertwined in the areas of life for most entrepreneurs, especially for female business owners [79-81]. The financial condition of a family can influence the decision-making process of women entrepreneurs. The researchers have acknowledged the importance of family dynamics for entrepreneurship success, and they found that the family may represent an asset or a liability, providing either enrichment or interference for the entrepreneur [82,83,84]. The figure below depicts the financial condition and the contribution of the family members of online women entrepreneurs of Bangladesh:

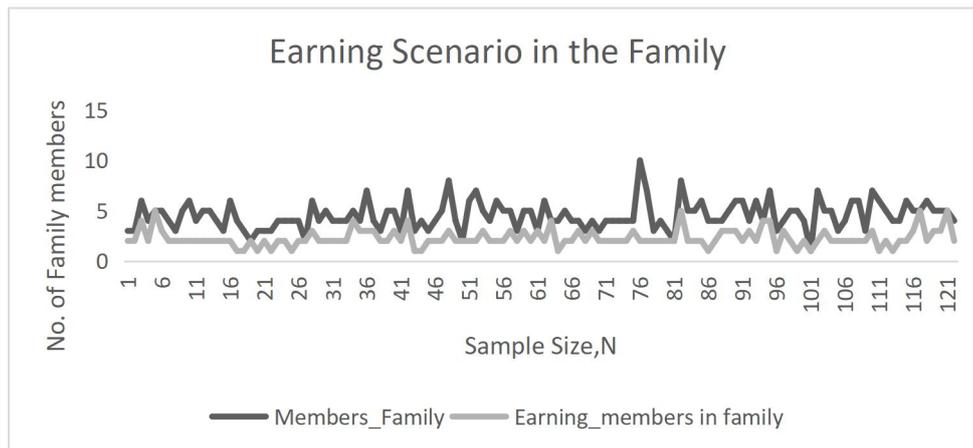


Figure 11. Earning Scenario in the family

The figure reflects that the number of earning family members in online women entrepreneurs’ families is less than the total number of family members, which shows that in every family, some member/s are dependent for their necessity on the earning members. The figure also depicts that the highest number of family members in a family can be 10, and, in that family, only 2 members might earn for the entire family. So, the family may be considered a liability for that online women entrepreneur as she might have to spend more money on her family rather than invest it in her business. According to researchers, access to financial capital is one of the important factors for women-owned businesses, especially during the start-up phase. It can provide a woman entrepreneur with more flexibility and control to focus on the management and growth of her business [85,86,87]. In the case of Bangladesh, online women entrepreneurs have higher chances of facing financial constraints due to their family structure and are less likely to get financial support for their business from their families.

Effects of COVID-19 on online women entrepreneurs in Bangladesh:

The immediate impact of COVID-19 on the business sector is found in Bangladesh, as the government imposed a forceful lockdown across the country. Restrictions on people’s movements and business activities through curfew and lockdown paused all economic and social activities, consequently causing economic, social, and psychological pressures [88]. Jaim’s (2020) study in the developing context of Bangladesh found that women had to decide whether to continue, discontinue, or shut down their businesses during the pandemic [89].

To analyze the COVID-19 pandemic's effect on online women entrepreneurs of Bangladesh, a quantitative analysis method is used in this paper, and data were processed using descriptive statistics methods. Descriptive analysis is the type of analysis of data that helps describe, show or summarize data points in a constructive way such that patterns might emerge that fulfill every possible condition of the data. It is one of the most important steps for conducting statistical data analysis.

In this statistical study, there are two types of variables is used. These are:

- **Independent variable:** It is a variable that stands alone and isn't changed or manipulated.
- **Dependent variable:** It is a variable that depends on other factors.

Table-1 shows the descriptive analysis where revenue earned by online women entrepreneurs in Bangladesh is consider as dependent variables, and all other variables (such as- covid, education, occupation, products, age of business, number of employees, mode of delivery etc.) are consider as independent variables. The descriptive table depicts the number of observations, mean, standard deviation, minimum value, maximum value, frequencies, and percentage of the variables. The values of the descriptive analysis are derived from the results of the survey data.

Table 1. Descriptive Statistics

Variable	Observation	Mean	Std. Dev.	Min	Max	Freq.	Percentage
Revenue	244	4782.918	17738.139	0	200000		
COVID	244	.5	.501	0	1		
Education respondent (School=0, Graduate=1, postgrad=2)	244	1.566	.513	0	2		
School/studying						2	0.82
Graduate/studying						102	41.80
Postgrad/studying						140	57.38
Occupation respondent (Surveyed business=0, Home Maker =1, Professional job=2, Services=3, Student=4, other business=5)	244	1.107	1.479	0	5		
Surveyed business						140	57.38
Home Maker						16	6.56
Professional job						40	16.39
Services						24	9.84
Student						18	7.38
Other business						6	2.46
Type of Products (Clothing=0, Accessories=1, Food=2, Home Decor=3, Stationaries/books=4, Gift products=5, Cosmetics=6)	244	1.615	2.063	0	6		
Clothing						118	48.36
Accessories						28	11.48
Food						40	16.39
Home Decor						8	3.28
Stationaries/books						14	5.74
Gift products						10	4.10
Cosmetics						26	10.66
Age business (in weeks)	244	38.857	36.023	0	264		
Number of employees	244	5.475	11.936	0	100		
Mode of Delivery	244			1	3		
Pickup	244	.172	.378	0		1	
Personal delivery	244	.385	.488	0		1	
Third party delivery	244	.795	.404	0		1	

Regression analysis through hypothesis testing is one of the ways to analyze how the COVID-19 pandemic impacts online women entrepreneurs in Bangladesh. The equation for regression analysis can be expressed as:

$$Y_o = \beta_o + \beta_i X_i + \epsilon_i$$

Here,

- Y_o represents the dependent variable
- β_o represents the coefficient of the dependent variable
- β_i represents i th number of coefficients of independent variables
- X_i represents i th number of independent variables
- ϵ_i represents the error term

The table below shows the results of linear regression modelling:

Table 2. Linear Regression Modelling

Variables	Revenue	
COVID	-0.148*	
	(0.0602)	
Education_ respondent owner	-0.0495	
	(0.0641)	
Occupation_ respondent owner	-0.0512*	
	(0.0216)	
Type_ Products	0.00544	
	(0.0152)	
Age_ business	0.000905	
Number_ employees	0.00344	
	(0.00090)	
	(0.00272)	
Pickup	-0.0256	
	(0.0884)	
Personal delivery	-0.189*	
	(0.0780)	
Third-party delivery	-0.277**	
	(0.0917)	
_cons	1.057***	
	(0.166)	
N	244	
R-sq	0.106	
Standard errors in parentheses		
* p<0.05	** p<0.01	*** p<0.001"

In this model, the dependent variable (Y_o) is 'Revenue', which reflects the earnings of online entrepreneurs of Bangladesh before the pandemic. The independent variable 'COVID' reflects the earnings during the pandemic. The other independent variable such as 'Education_ respondent owner' shows different level of education attained by online women entrepreneurs, 'Occupation_ respondent owner' reflects various occupation categories in which online women entrepreneurs are involved in, 'Type_ Products' shows different types of products that online women entrepreneurs sell in online market, 'Age_ business' reflects numerical value of the time period of the business existence using 'week' as unit, 'Number_ employees' shows the number of employees hired by the business owners, 'Pickup, Personal delivery, Third party delivery' are the different modes of delivery system use by online women entrepreneurs to deliver the product among customers.

By using the results of Table 2, the linear regression equation can be rewritten as:

Revenue = 1.057 -.148 covid -.049 Education_ respondent owner -.051 Occupation_ respondent owner + .001 Age_ business + .005 Type_ Products+ .003 Number_ employees-.026 pickup -.189 personal delivery -.277 third party delivery.

The value for R-squared is 0.106, which implies that 10.6% variation between independent and dependent variables in this model, and the number of observations is 244.

Robustness of the model

Robust regression is a form of regression analysis that is designed to overcome some limitations of traditional parametric and non-parametric methods. One of the basic assumptions for multiple linear regression modelling is homoscedasticity. Robust estimation is considered when there is a strong suspicion of heteroscedasticity. The table below shows the results of robust regression:

Table 3. Robust Regression Modelling

Variables	Model (1)	Model (2)
	Revenue	Revenue
COVID	-0.148*	-0.148*
	(0.0602)	(0.0602)
Education_ respondent owner	-0.0495	-0.0495
	(0.0641)	(0.0633)
Occupation_ respondent owner	-0.0512*	-0.0512*
	(0.0216)	(0.0218)
Type_ Products	0.00544	0.00544
	(0.0152)	(0.0145)
Age_ business	0.000905	0.000905
	(0.000905)	(0.000799)
Number_ employees	0.00344	0.00344*
	(0.00272)	(0.00139)
pickup	-0.0256	-0.0256
	(0.0884)	(0.0929)
Personal delivery	-0.189*	-0.189*
	(0.0780)	(0.0819)
Third party delivery	-0.277**	-0.277**
	(0.0917)	(0.0932)
_cons	1.057***	1.057***
	(0.166)	(0.166)
N	244	244
R-sq	0.106	0.106
Standard errors in parentheses		
** p<0.05	** p<0.01	*** p<0.001"

The equation for the robust regression model is:

Revenue = 1.057 -.148 covid -.049 Education_ respondent owner -.051 Occupation_ respondent owner + .001 Age_ business + .005 Type_ Products+ .003 Number_ employees -.026 pickup -.189 personal delivery -.277 third party delivery.

In Table 3, Model (1) represents the regression analysis results with standard error, and Model (2) represents the regression analysis results with robust standard error. Comparing Model (1) and Model (2) from Table 3, the standard errors between these two regression analyses are slightly different from each other, but the value of the coefficient and R-square value are identical. So, the model has less probability of having a heteroscedasticity problem.

Variance inflation factor (VIF)

VIF provides an index that measures how much the variance (square of the standard errors) of the estimated regression coefficients is increased because of potential multicollinearity. Mathematically, the VIF for a regression model variable is equal to the ratio of the overall model variance to the variance of a model that includes only that single independent variable. This ratio is calculated for each independent variable in this model.

Table 4. VIF Index

Variables	VIF	1/VIF
COVID	1	1
Education respondent owner	1.192	.839
Occupation respondent owner	1.118	.894
Type of Products	1.075	.93
Age of business	1.171	.854
Number of employees	1.161	.861
Pickup	1.232	.812
Personal delivery	1.594	.627
Third party delivery	1.513	.661
Mean VIF	1.229	.

The Mean VIF in this model is 1.229, which indicates a moderate correlation among the variables. So, there is a moderate chance for the model to have a multicollinearity issue.

As the modelling can fulfill the basic assumptions of the linear regression model, it is possible to conduct different hypothesis testing on this model to check whether and how online women entrepreneurs of Bangladesh are affected due to the COVID-19 pandemic. The result of different hypothesis testing is given below:

Ho: The COVID-19 pandemic does not affect online businesses led by women in Bangladesh.

H1: The COVID-19 pandemic affects online businesses led by women in Bangladesh.

Table 5. Linear Regression Modelling for COVID-19 Effect

VARIABLES	REVENUE	
COVID	-0.148*	
	(0.0618)	
_CONS	0.689***	
	(0.0437)	
N	244	
R-SQ	0.023	
Standard Errors in Parentheses		
** P<0.05	** p<0.01	***p<0.001"

In this table, linear regression can be expressed as: Revenue = $\beta_0 + \beta_1 \text{covid}$. Table-4 shows that the value for β_0 is .689 and the coefficient for COVID (β_1) is -1.48, which reflects that the pandemic has a negative effect on the online business led by women entrepreneurs in Bangladesh. At the significance level, p-value for COVID-19 < 0.05, there is good evidence to reject the null hypothesis. So, at a 95% confidence interval, we can conclude that the COVID-19 pandemic affects online businesses led by women in Bangladesh. COVID-19 may emerge as a threat to the online business sector in Bangladesh. The value for R-squared is 0.023, which implies that 2.3% of the variation in revenue earned by online women entrepreneurs is due to the COVID-19 pandemic. The survey result on small-and medium-scale business owners of a study found that more than half of the respondents feel that they will need to shut down their businesses if the lockdown continues for 4 months (Khan and Newaz, 2020). This shows that the pandemic has negative externalities on businesses.

The negative externality of the pandemic can be seen through the decision-making regarding the continuity of the online business. Due to the lengthy lockdown and other restrictions, most of the businesses shut down, and only a few online businesses decided to continue. The figure below shows the COVID-19 impact on online businesses led by women entrepreneurs:

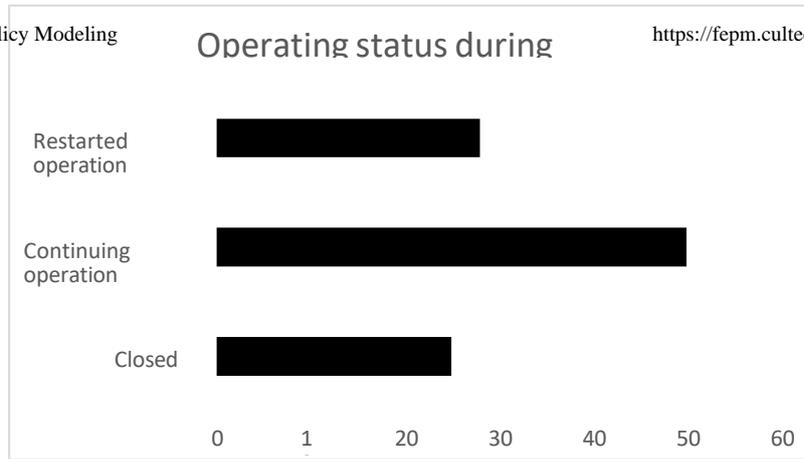


Figure 12. Operating Status during Pandemic

Figure 12 exhibits survey results of the operating status of online businesses led by women entrepreneurs during April to June. According to the figure, among 103 respondents, around 50 online women entrepreneurs decided to continue operating their business during lockdown and COVID restrictions, whereas more than 20 business owners decided to close their business permanently. The reason behind this scenario is given below:

i)Effect of COVID-19 pandemic on the financial condition on the online business led by women entrepreneurs in Bangladesh:

Ho: COVID-19 pandemic has no effect on the financial condition on the online business led by women entrepreneurs in Bangladesh.

H1: COVID-19 pandemic has effect on the financial condition on the online business led by women entrepreneurs in Bangladesh.

Table 6. Different Regression Models

VARIABLES	MODEL (1)	MODEL (2)	MODEL (3)
	Revenue	Revenue	Revenue
COVID	-0.148*	-0.148*	-0.148*
	(0.0610)	(0.0614)	(0.0610)
OCCUPATION_ RESPONDENT OWNER	-0.0583**		
	(0.0207)		
NUMBER_ EMPLOYEES		0.00525*	
		(0.00258)	
PICKUP			0.000632
			(0.0854)
PERSONAL DELIVERY			-0.176*
			(0.0772)
THIRD PARTY DELIVERY			-0.276**
			(0.0915)
_CONS	0.753***	0.660***	0.975***
	(0.0488)	(0.0457)	(0.103)
N	244	244	244
R-SQ	0.054	0.039	0.061
Standard Errors in Parentheses			
* P<0.05	** p<0.01	*** p<0.001"	

According to Table 1, almost 57.38% online women entrepreneurs’ main source of occupation is to run an online business. They usually reinvest the revenue earned from the business to continue the business. Only 16.39% engaged in professional jobs, and 9.84% are engaged in the service sector alongside online business. So, more than 50% women entrepreneurs’ main source of finance or income comes from online business, which helps them continue their business.

In the Table 5 Model (1) shows the financial condition of the online women entrepreneurs of Bangladesh. The

independent variable ‘Occupation_ respondent owner’ is a categorical variable which indicates different occupations in which online women entrepreneurs usually get involved alongside their business to finance their online business.

The linear regression can be expressed as: $Revenue = \beta_0 + \beta_1 covid + \beta_2 occupation$. It can be re-written by using the value from Table-5 Model (1) as:

$Revenue = .753 - .148covid - .058 occupation$. The coefficient for occupation is $-.058$. The negative coefficient indicates that COVID-19 impose financial restriction on online women entrepreneurs in Bangladesh which makes it difficult for them to continue the business. As a result, business get permanently shut down. The Table-5 also shows that at significance level, p value for occupation < 0.05 , there is good evidence to reject null hypothesis. So, at 95% confidence interval, we can conclude that COVID-19 pandemic has effect on the financial condition on the online business led by women entrepreneurs in Bangladesh. The value for R-squared is 0.054 which implies that 5.4% variation in revenue earned by online women entrepreneurs who are involved in different occupation during COVID-19 pandemic.

ii) Effect of COVID-19 pandemic on the employees engaged in the online business led by women entrepreneurs in Bangladesh:

H₀: COVID-19 pandemic has no effect on the employees engaged in the online business led by women entrepreneurs in Bangladesh.

H₁: COVID-19 pandemic effect on the employees engaged in the online business led by women entrepreneurs in Bangladesh.

In the Table-5 Model (2) reflects whether employees who are engaged in women led online business get effected during pandemic. The linear regression of this model can be expressed as:

$Revenue = \beta_0 + \beta_1 covid + \beta_2 \text{ number of employees}$.

The linear regression can be re-written by using the value from Table-5 Model (2) as:

$Revenue = .66 - .148 covid + .005 \text{ number of employees}$. The Model (2) shows that at significance level, p value for number of employees is 0.043. As, p value < 0.05 , there is good evidence to reject null hypothesis. So, at 95% confidence interval, we can conclude that the pandemic influences the employees engaged in the online business led by women entrepreneurs in Bangladesh. During pandemic, the online women entrepreneurs faced financial shocks which causes them to unable the salaries to employees on time. As a result, they cut down the number of employees or the employees are forced to leave their jobs. The value for R squared is .039 which indicates that 03.9% variation can be found in terms of employees worked in a women led online business during COVID-19 pandemic.

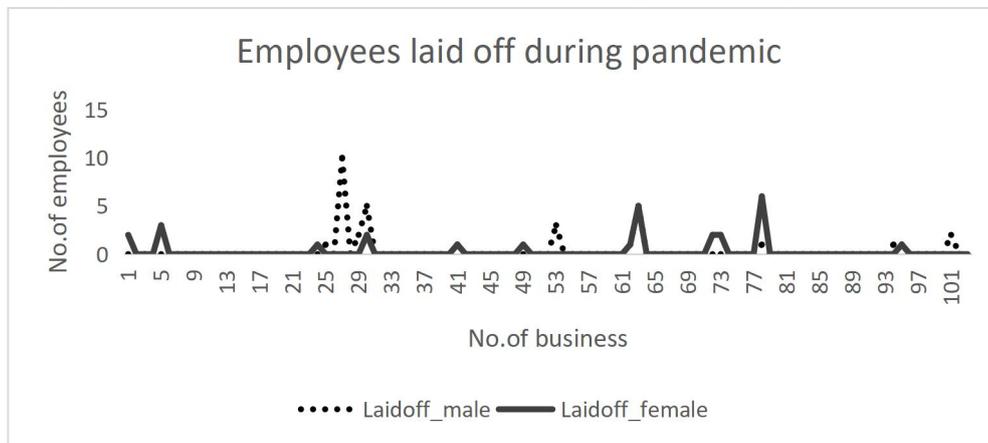


Figure 13. Employees laid off during the pandemic

Figure 13 exhibits the total number of employees as well as their respective gender of different online businesses led by women entrepreneurs. According to Table 1, the maximum number of employees a women-led online business hired before the pandemic shock was 100, and Figure 13 shows that due to the pandemic shock, the highest number of male employees laid off is 10, and the highest number of female employees laid off is 6-8 females in a women-led online business. It is also noticeable that in most businesses, female employees get laid off from their jobs.

iii) Effect of the COVID-19 pandemic on various modes of delivery service used by online women entrepreneurs in Bangladesh:

In online business, the mode of delivery system plays an important role. Without a mode of delivery service, it is impossible to run online business. Typically, in Bangladesh, women entrepreneurs use three different types of product delivery service in order to deliver the product to its customers. These are: (a) Pick-up service, (b) Personal delivery and (c) Third –party delivery service. In case of pick-up service, the entrepreneurs provide the customer an address from where the customer can collect his/her product. In personal delivery or in-person delivery system, the owner personally

delivers the product, or the employee of that business deliver the product to the customer in-person whereas in third person delivery system, businesses hired a third person delivery company which deliver the product to the customers on the behalf of the online businesses. Some online business offers only one mode of delivery system, and some might offer all three options of delivery services to its customers.

In order to check whether pandemic has any effect on the delivery system of the product, a hypothesis testing has been conducted. The hypothesis is given below:

H₀: COVID-19 pandemic has no effect on various mode of delivery service used by online women entrepreneurs in Bangladesh.

H₁: COVID-19 pandemic effect on various mode of delivery service used by online women entrepreneurs in Bangladesh.

In the Table-5 Model (3) shows the effect on revenue earned by online entrepreneurs when using various mode of delivery service to deliver the product during pandemic. The linear regression can be expressed as: Revenue = $\beta_0 + \beta_1 \text{covid} + \beta_2 \text{pickup} + \beta_3 \text{personal delivery} + \beta_4 \text{third party delivery}$.

The regression can be re-written by using the value from Table-5 Model (3) as:

Revenue = .975 -.148 covid +.001 pickup -.176 personal delivery -.276 third party delivery. The Model (3) also shows that at significance level, p value for pick-up service is > 0.05 , there is no sufficient evidence to reject null hypothesis. So, at 95% confidence interval, we can conclude that the pandemic has no effect on pick-up delivery system offered by online business. The Model (3) depicts that at significance level, p value for personal delivery service is < 0.05 , there is enough evidence to reject null hypothesis. So, at 95% confidence interval, we can conclude that the pandemic effect on personal delivery service. From the Model (3), we can also derive that, p value for third party delivery service is < 0.05 . So, there is enough evidence to reject null hypothesis. So, at 95% confidence interval, it can be concluded that the pandemic effect on third party delivery service. The coefficient for both personal delivery system and third-party delivery system is negative which reflects that pandemic causes negative effect on the business that provide these two types of delivery service. The strict restriction and lockdown from government might causes these two services to become inefficient during pandemic which can causes business to lose customers and face loss in the business. Another reason might be the fear of health hazard which prevents customers to use these services to get their products. As a result, the businesses which provide either one of these services or both, have a chance of losing the customers and face loss in business. The value of R-squared is .061 which implies that 6.1% variation can be found in the revenue earned by online women entrepreneurs who facilitate different mode of delivery system during pandemic.

6. Conclusion

The results of the current study provide some interesting and important implications at the academic levels, research levels, and to e-commerce female owners, regulatory bodies, and all related individuals associated with the online business sector.

Online women entrepreneurship started its journey in Bangladesh at the beginning of the 21st century, and it became quite famous in a short amount of time due to its distinctive features. Online entrepreneurship helps women to empower themselves as well as helps improve their families' economic conditions. The study in this paper shows how ICT facilities and network is the key component to run the online business smoothly. Access to finance, access to education, family condition, etc., are the determining factors for Bangladeshi women to invest in online entrepreneurship. Access to different social media platforms and MFS facilities also helps in women-led online businesses. E-commerce business customers evaluate the product by looking at the picture posted by businesses in various social media and online platforms; hence, the product line ranges from clothing, food, jewelry, fashion accessories, cosmetics, home decor items, etc.

The paper also finds that the negative externalities of recent COVID-19 have a significant impact on women-led online businesses in Bangladesh. The month-long lockdown, health hazards, and an atmosphere of uncertainty have created unfavorable conditions for earning revenue and forced most women entrepreneurs to either temporarily or permanently shut down their businesses. Pandemic creates obstacles in terms of finance, labor supply, and the service delivery system. The online women entrepreneurs are finding it difficult to deliver the product on time due to the restrictions associated with the pandemic and are losing their customers. As a result, the overall operation and management system of the business is getting hampered due to the COVID-19 pandemic. Government and related authorities need to take some steps so that this industry can survive the negative impact of the pandemic and the business can sustain. Otherwise, progress in women's empowerment could be hampered, and the country could face economic-related shocks.

This research paper uses quantitative methods to analyze the key characteristics of female-led online businesses in Bangladesh and how the COVID-19 pandemic affects the economic and sustainable development of this sector. Future researchers can focus their study area on how online women entrepreneurship is affected in health and social aspects due to the COVID-19 pandemic. Also, this research focus on only one country scene due to the limitation of time and resources. So, future researchers can conduct a cross-country analysis to compare the intensity of the pandemic effects between different countries.

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Appendix-01

Table: One-way Index for COVID-19 pandemic effect

. oneway revenue covid,t

covid	Summary of revenue		
	Mean	Std. dev.	Freq.
0	5742.5911	20112.823	122
1	3823.2443	15016.68	122
Total	4782.9177	17738.139	244

Source	Analysis of variance			F	Prob > F
	SS	df	MS		
Between groups	224717415	1	224717415	0.71	0.3992
Within groups	7.6233e+10	242	315013160		
Total	7.6458e+10	243	314641573		

Bartlett's equal-variances test: chi2(1) = 10.1451 Prob>chi2 = 0.001

Appendix-02

Table: Covariance Coefficient Model

Covariance matrix of coefficients of regress model

e(V)	covid	Education_~r	Occupati~r	Type_Pro~s	Age_busi~s	Number_e~s	pickup	Personal~y	Thirdpar~y	_cons
covid	.00361851									
Education_~r	0	.00411499								
Occupation~r	0	.00031051	.00046464							
Type_Produ~s	0	.00012832	-.000023	.00022959						
Age_business	0	-4.293e-07	2.119e-06	9.541e-07	8.195e-07					
Number_emp~s	0	2.799e-06	6.740e-06	-4.713e-06	-7.809e-07	7.406e-06				
pickup	0	.00118733	.00015625	-.0002017	-.00001017	.00002931	.00782183			
Personalde~y	0	.00091072	.00004127	.0000443	-8.204e-06	.0000148	-.00098493	.00608943		
Thirdparty~y	0	.00071039	-.00012052	-.00005	-6.110e-06	2.356e-07	.00108996	.00378952	.00840038	
_cons	-.00180926	-.00811181	-.00102937	-.00050004	-.00002101	-.00002537	-.00330503	-.00649463	-.00898844	.02762828