



WOMEN ENTREPRENEURSHIP IN BIOMEDICAL START-UPS IN KERALA: CHALLENGES AND OPPORTUNITIES

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ABSTRACT

The surge of women entrepreneurs in Kerala's biomedical sector is a recent phenomenon contributing significantly to the state's progress. This study investigates the challenges and opportunities faced by women entrepreneurs in biomedical start-ups in Kerala. Despite commendable performance, women encounter obstacles in finance, societal expectations, and gender-specific barriers. Business incubators, crucial in mitigating these challenges, play a pivotal role. The study explores major business incubators like BioNest, Business Innovation and Incubation Center (BIIC), and Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST-TIMed), government schemes supporting entrepreneurship, and the experiences of women entrepreneurs in the biomedical field. Interviews, on-site visits, and literature review form the research methodology. The results illuminate the multifaceted journeys of prospective and incubator-backed women entrepreneurs, providing valuable insights into their motivations, challenges, support needs, and future aspirations. The findings underscore the need for tailored support ecosystems, comprehensive funding awareness, and initiatives fostering gender-inclusive innovation.

KEYWORDS: biomedical, women entrepreneurship, business incubators, Kerala.

1. INTRODUCTION

The emergence of women entrepreneurs in Kerala is a recent and noteworthy development, contributing significantly to the state's progress. Despite their commendable performance, women in the unorganized sector face challenges in finance, personal, social, raw material, marketing, labor, managerial, infrastructural, technological, and governmental aspects. Streamlining these challenges is crucial for fostering their continued success^[1]. To mitigate these issues business incubator plays a major role. They support early-stage companies, guiding them from concept to market. They offer mentorship, investment prospects, and access to resources, including shared office space. These programs aim to help startups develop a viable product and establish a feasible plan for market entry. If a startup has already launched its product, it may be better suited for a business accelerator designed for more advanced-stage development^[2]. India boasts over 400 incubators, many in their early stages. The Startup India initiative focuses on strengthening existing incubators and facilitating the establishment of new ones to enhance entrepreneurial capacities nationwide. The 4 major schemes by central government are Department of Science & Technology- Technology Business Incubator program (DST-TBI), BioNest under DBT, Atal Innovation Mission- Atal Incubation Centres (AIM-AICs) and The Ministry of Electronics and Information Technology Technology Incubation and Development of Entrepreneurs (MeitY-TIDE 2.0). The DST-TBI initiative aims to boost startups aligning with national priorities, providing cost-effective services. BioNest, under DBT, supports biotech incubation through Biotechnology Industry Research Assistance Council (BIRAC), establishing new hubs and strengthening existing ones. AIM-AIC focuses on creating incubation centers across sectors, emphasizing inclusive growth in underserved areas. MeitY-TIDE 2.0 provides tailored support for startups and fostering innovation ecosystems^[3]. Key business incubators in Kerala, including BioNest Kochi, BIIC Kottayam, and TIMed Trivandrum, prominently emphasize the biomedical sector. These incubators play a vital role in fostering innovation and supporting startups, with a major focus on nurturing ventures in the dynamic and impactful field of biomedicine. In recent years, there has been a noteworthy increase in the enrollment of Indian women in STEM courses; however, the transition to STEM careers remains a challenge, with only 29% making this shift^[4]. A substantial portion of women in STEM, approximately 50%, is concentrated in Biological Sciences, while others are distributed across Chemists & Materials Scientists, Computer & Mathematical Occupations, and Engineers & Architects. The report underlines the difficulties in retaining women in the STEM workforce, reflecting a broader concern in gender diversity within scientific domains^[5]. Meanwhile, Kerala, endowed with the UNESCO-listed biodiversity hotspot of the Western Ghats,



boasts a high concentration of science graduates and technology professionals. This has positioned the state as a focal point for biomedical research, leveraging its diverse ecosystems and existing research institutions ^[6]. This study seeks to delve into the dynamics shaping the participation of women in the biomedical field within the state, acknowledging both the challenges and opportunities inherent in this vibrant research field.

1.1 RESEARCH QUESTION

What are the key challenges and opportunities faced by women entrepreneurs in the biomedical sector in Kerala?

1.2 OBJECTIVES

- To identify the specific barriers and facilitators for women entrepreneurs in Kerala's biomedical industry.
- To analyse the support ecosystem (like incubators) available for women-led biomedical start-ups in Kerala.

2. RESEARCH METHODOLOGY

2.1 Interviews as the Cornerstone

The research methodology for exploring women entrepreneurship in biomedical start-ups in Kerala primarily relies on interviews. Two distinct categories of interviews were conducted to gather comprehensive insights.

i) Prospective Entrepreneurs: Explored motivations, backgrounds, and gender-specific challenges driving women into biomedical entrepreneurship. Analyzed resource needs, emphasizing funding, mentorship, and training accessibility. Investigated gender dynamics in Kerala's biomedical sector through personal experiences. Delved into entrepreneurial visions, expectations, and a five-year outlook.

ii) Incubator-Backed Entrepreneurs: Traced the journey of starting biomedical ventures, emphasizing initial hurdles and strategies for overcoming them. Assessed the impact of business incubators, identifying programs supporting women entrepreneurs. Explored strategies to address gender-specific hurdles, providing insights into the incubator's role.

2.2 Interaction with Major Incubators

The study extends beyond interviews, incorporating on-site visits to major incubators—BioNest Biotech Incubation Centre, Business Innovation and Incubation Center (BIIC) at Mahatma Gandhi University, and Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST-TIMed). Each visit included discussions with key personnel:

- BioNest Kochi: Interview with CEO, shedding light on the facility's unique features and contributions to biomedical and other fields.
- BIIC Kottayam: Discussions with the Director, exploration of available grants, and insights into upcoming projects.
- SCTIMST-TIMed: Interview with CEO, discussed the objectives, opportunities and facilities of TIMed.

2.3 Information Synthesis

Apart from direct interactions, information was collated from incubator websites, and also literature review. The process involved extracting pertinent details about opportunities provided, especially for women entrepreneurs, and understanding the incubators' roles in nurturing innovation. This comprehensive approach, blending interviews, on-site visits, and website analysis, aims to paint a nuanced picture of the challenges, opportunities, and support mechanisms within the biomedical entrepreneurial landscape for women in Kerala.

3 RESULTS AND ANALYSIS

3.1 Prospective Women Entrepreneurs

The exploration of women entrepreneurship in Kerala's biomedical industry involved in-depth interviews with prospective women entrepreneurs. The focus was to unravel their backgrounds, motivations, and expectations, shedding light on the challenges and opportunities they encounter in this dynamic sector.

3.1.1. Background and Motivation

Participants shared diverse motivations, blending academic expertise with a commitment to innovative biomedical solutions.



Participant1 (P1) said, "I am a biomedical engineering graduate, and my academic background guides me through the complexities of healthcare. The urgent need for cost-effective medicinal solutions to create an impact on healthcare is what propels me into biomedical entrepreneurship."

P2 mentioned, "My foundation is in chemistry, and I'm fascinated by the convergence of science and healthcare. That's what drives my entrepreneurial pursuits. My motivation is to address healthcare challenges and make a meaningful impact, directing me to explore biomedical business opportunities at the same time I am also looking for financial independence."

P3 added, "I specialize in a field closely aligned with biomedical engineering. My academic journey underscores the critical need for inventive healthcare solutions. Realizing the importance of enhancing the efficiency of medicinal products inspires my venture into biomedical entrepreneurship, aligning with the pressing demand for innovation in healthcare."

3.1.2. Perceived Challenges and Barriers

Women entrepreneurs shed light on the hurdles they navigate, from family-related issues to societal expectations and financial barriers.

P1 highlighted, "Facing family-related issues like demotivation, marriage, and the belief that the biomedical field isn't profitable for starting a venture is a constant challenge. It's tough to balance entrepreneurial pursuits with familial responsibilities."

P2 expressed, "Societal expectations, especially those disproportionately burdening women, become hindrances. These expectations limit the time and energy available for startup endeavors."

P5 shared, "The loan and the guarantee issue are major problems. Also, I was the only woman in my entire family interested in becoming an entrepreneur. The absence of a supportive ecosystem adds to the formidable hurdles. These challenges significantly impact women entrepreneurs in their pursuit of success."

3.1.3. Resource and Support Needs

In addressing this issue, participants, underscored the crucial importance of mentorship, tailored training programs, and funding awareness for women entrepreneurs in the biomedical field.

P4 emphasized, "Beyond just getting money, we really need mentorship and training programs that fit our needs. We're saying it's crucial to sharpen our business skills, especially for women doing business in biomedicine."

P5 pointed out, "We all agree that funding is super important, but not everyone knows about it. We all want detailed info on where to get funds that suit women in the biomedical business."

3.1.4. Gender Dynamics

Gender dynamics in the biomedical field, participants shared challenges faced due to bias and expressing optimism about the growing support systems for women.

P2 explained that, "Handling the male-dominated biomedical scene has its challenges. Bias affects how I do business and get funding. But, on the flip side, I believe there are many supporting systems for women."

P5 added, "I don't think, in recent times, gender-related issues didn't even exist. A pool of opportunities is there. If we have significant ideas, gender will not matter anymore, whether women or men."

3.1.5. Vision and Expectations

Participants share a common vision for success, emphasizing societal impact and accessible medical solutions with a commitment to pioneering transformative innovations in the biomedical field.

P5 envisioned success through societal impact, emphasizing accessible medical solutions for all. Her aspiration reached beyond Kerala, aiming to contribute to communities across India. The driving force was a commitment to pioneering transformative biomedical innovations. P6's vision of success was intricately tied to societal impact, emphasizing the democratization of medical solutions for universal accessibility. Her aspirations extended



nationally, with a commitment to pioneering innovative solutions that bring transformative change to the biomedical field.

The findings underscore the multifaceted nature of their journeys, from navigating societal expectations to addressing financial barriers, and highlight the collective vision of these entrepreneurs to drive positive change in healthcare accessibility.

3.2 Women Entrepreneurs Incubated at a Business Incubator

The research delves into the experiences and insights of women entrepreneurs in the biomedical sector in Kerala. The study aimed to understand their entrepreneurial journey, the role of incubators, gender-specific challenges, advice for aspiring entrepreneurs, and the future outlook. Interviews were conducted with successful entrepreneurs incubated at prominent centers, including Bionest Biotech Incubation Centre, BIIC at Mahatma Gandhi University.

3.2.1. Entrepreneurial Journey and Experience

Entrepreneurs shared their transformative journeys in Kerala's vibrant ecosystem, where initial hesitance evolved into enthusiasm, fueled by the promise of incubators, grants, and impactful contributions.

P1 was a bit unsure at first. They said, "I got really interested in Kerala's lively startup scene because of incubators and grants. The cool stuff they're working on and the chance to make a real impact caught my attention."

As for P2, dealing with money issues and personal conflicts was tough, but knowing about incubator support and grants made a big difference. They mentioned that family support and being aware of incubator help were key to getting through those challenges.

P3 shared, "Even though people expected different things from me, finding out about Kerala's incubators and grants turned my hesitation into excitement. The interesting projects and the chance to make a meaningful difference got me excited about the entrepreneurial journey."

3.2.2. Incubator Support

In navigating their entrepreneurial paths, participants underscored the pivotal role of incubators in shaping business ideas, facilitating grant applications, and providing crucial support throughout their journey.

P1 shared, "Incubators played a vital role in shaping our business ideas. They gave me an idea about grants and offered guidance on securing grants from Kerala Startup Mission, DST, and BIRAC. Also, they provided essential tools and dedicated workspaces, which significantly impacted my entrepreneurial journey."

In contrast, P3 said, "Specializing in a field aligned with biomedical engineering, I found incubators to be instrumental. They not only helped with grant applications for presentations but also provided collaborative opportunities with hospitals. These turned out to be crucial pillars in my entrepreneurial journey."

P4 chimed in, "Coming from a chemistry-related discipline, incubators were useful in guiding us through the development phase. They provided ample space and instruments for my characterization studies. Additionally, they offered support in securing grants for further project development".

3.2.3. Gender-Specific Experiences

In gender-specific experiences, some responded that no such practices are seen anymore even though, some entrepreneurs highlighted overcoming challenges with determination, knowledge, and incubator support, emphasizing the resilience needed to address biases.

P1 expressed, "To tackle challenges linked to gender in entrepreneurship, you need determination, know-how, and the priceless support from an incubator. Being tough is crucial to handling biases and getting through these hurdles."

P2 said, "In my journey as an entrepreneur, gender didn't make a big difference. Having mental support, especially at the beginning, was vital, emphasizing the need for a strong support system no matter your gender."



3.2.4. Advice and Insights

For aspiring women entrepreneurs, participants emphasize the importance of government grants, while others underscore the need to highlight facilities and grants to boost confidence in taking entrepreneurial leaps.

P3 emphasized, "For women entrepreneurs, tapping into government grants is key. Awareness about these resources is crucial, and exploring state and central government initiatives can pave the way for successful ventures."

P4 added, "Highlighting facilities and grants is vital to empower aspiring women entrepreneurs. Overcoming the fear of starting a new venture, particularly among women, requires providing ample information and support."

3.2.5. Future Outlook

Participants envision a surge in innovative biomedical solutions, focusing on cost-effective products like biodegradable wound dressings. They also aim to play a pivotal role in crafting impactful and affordable biomedical advancements.

P1 envisioned, "We're expecting lots of new projects, especially making things like affordable wound dressings from biodegradable materials. We think there'll be a bunch of cool ideas in the biomedical field. Our goal is to help make biomedical stuff easier to get and cheaper."

P2 shared, "We want to start companies and put out products that people can afford. We hope to be a big part of making innovative biomedical solutions more available. The future looks promising for women entrepreneurs making impactful and affordable products."

3.3 Empowering Women in Biomedical Entrepreneurship: Nurturing Innovation through Incubation Centers in Kerala

In the evolving landscape of biomedical entrepreneurship in Kerala, women entrepreneurs thrive with innovation. Key incubation centers like BioNest, BIIC, and TIMed shape this journey. Data collection involved lab visits, interviewing BioNest's CEO and research assistant, BIIC's Director and scientist, and TIMed's CEO.

3.3.1 BioNest Biotech Incubation Centre

3.3.1.1. Incubation Support: The CEO mentioned, "we offer a four-year support system for start-ups, ensuring a smooth transition to independence. This collaboration between Rajiv Gandhi Centre for Biotechnology (RGCB) and Kerala Startup Mission (KSUM) provides comprehensive assistance, covering technological guidance, intellectual property rights, regulatory compliance, and support in securing venture capital."

3.3.1.2. Collaboration and Networking: CEO highlighted, "We collaborate with hospitals, utilize virtual incubation, and offer specialized lab services. Our consultancy and transparent grant process, along with affordable space at ₹10 per sq. ft., support aspiring entrepreneurs' accessibility and innovation."

3.3.1.3. Impact and Contribution: The BioNest Kochi research assistant highlighted, "Accessing government grants is a catalyst for women entrepreneurship in biomedical start-ups. Awareness about these resources is crucial, and exploring government initiatives can pave the way for successful ventures." Emphasizing further, she added, "Diverse laboratories play a crucial role in fostering innovation in biotechnology and life sciences. These environments provide a rich breeding ground for creativity and breakthroughs in the biomedical field."

3.3.2. BIIC at Mahatma Gandhi University

3.3.2.1. Support and Initiatives: The Director of BIIC Kottayam shared, "We've supported almost 121 student start-ups, with 17 companies successfully graduating. Our Research Incubation Programme, funded by Kerala Startup Mission, is backing 24 student and faculty innovators. Exciting projects on the horizon include establishing an animal cell culture lab and an international lab for medicinal studies." This signifies our commitment to fostering innovation and providing tangible support for the entrepreneurial journey of students and faculty alike.

3.3.2.2. Transformational Impact: A scientist from BIIC Kottayam stressed, "Bridging academia and industry is crucial. BIIC serves as a dynamic bridge, fostering the flow of knowledge and innovation." Additionally, she highlighted, "BIIC cultivates an innovative culture, shaping individuals for entrepreneurial journeys by encouraging creative thinking and risk-taking. Notably, BIIC's pride lies in notable start-ups contributing significantly to the biomedical landscape, showcasing our commitment to fostering innovation."



3.3.3. SCTIMST-TIMed

3.3.3.1. Vision and Mission: CEO of TIMed commented that: "Fueled by innovation passion, our society thrives on collaboration. With KSIDC and DST backing, we empower entrepreneurs for impactful advancements in medical technology. Together, we aim to build a vibrant ecosystem driving positive change in healthcare solutions."

3.3.3.2. Support Services: CEO of TIMed noted, "Our support includes business and technical mentorship, risk analysis, and regulatory compliance for budding entrepreneurs. Tailored training programs and hands-on assistance ensure a seamless venture setup." "Additionally," the CEO added, "TIMed entrepreneurs benefit from SCTIMST's proven track record in medical device development, offering invaluable expertise to guide their entrepreneurial journey."

3.3.3.3. Contributions and Focus: CEO emphasized, "Our strategy centers on collaboration with researchers, clinicians, and industry players, fostering innovation in medical technology. Our focus aligns with India's need for indigenous medical technology, echoing the Make In India initiative. In positioning TIMed Trivandrum, we aspire to be a pivotal player, nurturing medical device innovation through strategic alliances, R&D, and contributing significantly to healthcare technology nationwide."

4. DISCUSSIONS AND FINDINGS

4.1 Challenges in Women Entrepreneurship in Biomedical Start-ups in Kerala

4.1.1. Family-Related Challenges

- Women entrepreneurs consistently highlighted navigating family-related challenges as a significant hurdle.
- The delicate balance between familial responsibilities and the demands of entrepreneurship emerged as a recurring theme.

4.1.2. Societal Expectations

- Societal expectations, especially disproportionately burdening women, were identified as hindrances.
- These expectations limited the time and energy available for women to dedicate to their biomedical start-up endeavors.

4.1.3. Financial Constraints

- Financial barriers were a formidable challenge, impacting women entrepreneurs in the biomedical sector.
- The study identified a recognized lack of awareness regarding funding sources tailored to meet the distinct requirements of women in this entrepreneurial landscape.

4.1.4. Lack of Support Ecosystem

- The absence of a supportive ecosystem tailored for women entrepreneurs in the biomedical field was emphasized.
- Comprehensive support, beyond just funding, was identified as a resounding need, including mentorship and tailored training programs.

4.1.5 Funding Support from BIRAC, DST, and KSM

- While government initiatives like BIRAC, DST, and Kerala Startup Mission offer funding support, awareness gaps were identified.
- Participants stressed the importance of disseminating comprehensive information on funding sources to meet the specific needs of women entrepreneurs in the biomedical sector.

4.2. Opportunities in Kerala especially in biomedical field

4.2.1 Services commonly available at biomedical incubators for entrepreneurs

- **Incubation Support Programs:** Provide a structured support system for start-ups, offering assistance over a defined period to facilitate a smooth transition to independence.
- **Technological Guidance:** Offer expertise and guidance in navigating the latest technologies relevant to the biomedical field.
- **Intellectual Property Rights (IPR) Assistance:** Assist in understanding, protecting, and navigating the complexities of intellectual property rights for innovations and inventions.
- **Regulatory Compliance Support:** Guide entrepreneurs through the regulatory landscape, helping them understand and comply with the necessary standards and requirements.



- Venture Capital Support: Assist in securing venture capital by providing resources, networks, and guidance on fundraising strategies.
- Collaboration and Networking Opportunities: Facilitate connections with industry professionals, hospitals, and other entrepreneurs to foster collaboration and partnerships.
- Specialized Lab Services: Provide access to well-equipped laboratories, including facilities for Analytical Chemistry, Cell Biology, Genomics, and more.
- Transparent Grant Processes: Establish clear and transparent processes for accessing grants, making it easier for entrepreneurs to secure funding for their projects.
- Affordable Workspace: Offer cost-effective office spaces, reducing financial barriers for entrepreneurs, such as the example of ₹10 per sq. ft. mentioned for BioNest.
- Training and Mentorship Programs: Provide tailored training programs and mentorship initiatives to nurture the skills and knowledge needed for entrepreneurial success.

4.2.2. Facilities available at incubation centres

Bionest Kochi	42,000 sq. ft. facility in proximity to academic institutions and hi-tech parks, State-of-the-art incubation spaces, R&D labs, and essential facilities, Well-equipped laboratories include Analytical Chemistry, Cell Biology, Genomics, and more, Effluent Treatment Plant and DG backup for uninterrupted operations ^[7] .
BIIC Kottayam	Administrative, academic, technical, and intellectual property assistance, Collaboration with hospitals for molecular studies and the development of medical products, Physical office space, mentorship programs, and networking opportunities ^[8] .
TIMed Trivandrum	Modular office spaces, wet and dry laboratories, clean workspaces, Access to extensive facilities of SCTIMST, including analytical and design workstations, Emphasis on providing a nurturing environment for medical device innovation ^[9] .

4.2.3 Funding schemes

BIRAC's Contribution:	BIRAC plays a crucial role in advancing the 'Make In India' vision for biotech. With schemes like E-YUVA and the BIRAC-TIE Entrepreneurship Award, it focuses on supporting women entrepreneurs in the biotech sector ^[10] .
DST's Focus:	DST, through NIDHI, supports women entrepreneurs and student innovators in their early startup stages, emphasizing risk reduction and fostering diversity in the startup ecosystem ^[11] .
SERB's Role	While not explicitly focused on women entrepreneurs, SERB's financial assistance to individuals and institutions contributes to a research landscape conducive to innovative enterprises ^[12] .
Kerala Startup Mission (KSM)	KSM stands out in supporting over 4100 startups and disbursing grants exceeding 22 crores. Notably, it provides specialized support for women entrepreneurs through schemes like Soft Loan and events like the Women Startup Summit, promoting inclusivity in Kerala's entrepreneurial landscape ^[13] .

4.3 Suggestions

4.3.1. Online Webinars and Workshops

- Conduct regular online sessions to raise awareness about funding opportunities provided by central and state governments, specifically targeting women entrepreneurs in the biomedical sector.
- Collaborate with industry experts, successful women entrepreneurs, and funding agencies to share insights and experiences through webinars.

4.3.2. Start College Students-Focused Programs

- Establish programs in collaboration with colleges to educate and inspire students about entrepreneurship in the biomedical field.
- Provide mentorship sessions, case studies, and success stories to empower young women with the knowledge and confidence to pursue entrepreneurial ventures.
- Incubators can foster innovation by organizing college-wise competitions, providing a platform for new ideas and facilitating access to grants that empower students to kickstart their startups.

4.3.3. Targeted Awareness Campaigns

- Design targeted digital campaigns highlighting success stories of women entrepreneurs who have overcome family-related challenges and financial constraints.



- Utilize social media platforms to share information about available support ecosystems, funding options, and success stories.

4.3.4 Industry Collaboration Initiatives

- Foster collaborations between biomedical industry players and women entrepreneurs by creating platforms for knowledge exchange.
- Encourage established companies to mentor and support women-led start-ups, bridging the gap in the support ecosystem.

5. CONCLUSION

Women entrepreneurship in biomedical start-ups in Kerala presents a dynamic landscape filled with challenges and opportunities. Family-related issues, societal expectations, financial constraints, and gender-specific hurdles are significant challenges faced by prospective women entrepreneurs. However, the vibrant support ecosystem, particularly through business incubators, contributes significantly to their success. Initiatives like DST-TBI, BioNest, BIRAC, and KSM along with major incubators like BioNest Kochi, BIIC Kottayam, and TIMed Trivandrum, emphasize the biomedical sector, fostering innovation and supporting start-ups. The study recommends targeted awareness campaigns, industry collaborations, and educational programs to empower and encourage women entrepreneurs. The findings provide a comprehensive understanding of the current scenario, laying the foundation for policy interventions and support initiatives that promote inclusivity and innovation in Kerala's biomedical entrepreneurial landscape.

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