



Sustaining human capital through inclusive household finance: Gold-backed pawning as a pathway toward sustainable medical education financing

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ABSTRACT

Background: Sustainable human capital development in low- and middle-income countries depends on households' capacity to withstand financial shocks threatening educational continuity. In Indonesia, escalating medical education costs have intensified household financial vulnerability, particularly where formal student loans and bank credit remain limited, raising concerns for the sustainability of the medical workforce pipeline. This paper examines gold-backed pawning, primarily through Indonesia's state-owned PT Pegadaian, as an inclusive financing mechanism supporting sustainable household livelihoods through rapid, collateralized liquidity without reliance on credit scoring. **Methods:** Using a narrative-conceptual review design, this study synthesizes interdisciplinary evidence from 45 Scopus-indexed studies (2010–2023) on household finance, Islamic pawnbroking (*ar-rahn*), digital financial innovation, and medical education financing, examining how household gold functions as an emergency liquidity buffer for human capital investment, and how Pegadaian operationalizes inclusive, Sharia-compliant, digitally enabled (e-gadai) access aligned with sustainable development goals. **Findings:** Gold-backed pawning bridges liquidity gaps for tuition arrears, clinical rotation fees, certification costs, and health-related shocks, offering a more sustainable alternative to asset liquidation or high-cost informal borrowing. However, persistent risks—short loan tenors, gold price volatility, LTV information asymmetry, and repeated reliance among vulnerable households—may undermine long-term welfare if unmanaged. **Conclusion:** Gold-backed pawning can be reframed from an ad hoc coping strategy into a structured, sustainable human capital financing instrument, provided it is embedded within stronger consumer protection, financial literacy, and institutional partnerships. **Novelty/Originality of this article:** This paper proposes a novel four-pillar Gold-for-Education framework integrating household gold holdings, Pegadaian-led intermediation, Islamic social finance overlays (cash *rahn*, CSR), and targeted disbursement pathways for medical education—a structured model for inclusive human capital financing in developing economies.

KEYWORDS: e-gadai; emergency liquidity; financial inclusion; financial literacy; gold-based microfinance; Gold-backed pawning; household resilience; loan-to-value (LTV); medical education financing; Pegadaian.

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1. Introduction

The rising cost of medical education in Indonesia has intensified financial pressures on households, particularly those in low- and middle-income countries (LMICs) segments. Studies consistently show that medical education is characterized by high and escalating expenses that reflect long-term financial commitments, ranging from tuition and clinical training fees to rising living costs for medical students (Bachri, 2024; Dewanto, 2014). Structural shifts in the national health financing ecosystem, including *Jaminan Kesehatan Nasional* (JKN) reimbursement mechanisms and the calibration of institutional budgets under Indonesian Case-Based Groups (INA-CBG) based payment systems, further influence how medical schools redistribute operational costs to students (Sadino & Rahmatullah, 2021). As a result, families face increasing vulnerability to financial shocks, heightening the risk of study interruption or drop-out when liquidity gaps emerge (Hayati et al., 2025). In Singapore, more than 20% of students have a loan, as found by Sayampanathan et al. (2017). The situation is more severe in the United States, with 75% of students having loan debt for their studies (Asch et al., 2020). These challenges underscore the urgent need for accessible and reliable financial mechanisms that can sustain educational continuity in high-cost professional fields such as medicine.

Within this landscape, gold serves as one of the most culturally embedded and widely held liquid assets among Indonesian households. It functions as a stable store of value and an accessible emergency buffer that can be mobilized during periods of financial stress (Bachri, 2024; Dewanto, 2014). Gold-backed pawning, particularly through *Pegadaian*, has therefore re-emerged as a vital financial inclusion mechanism that provides rapid, collateralized liquidity without relying on conventional credit assessments. Evidence from recent analyses indicates that *Pegadaian*'s gold-backed pawning offers accessible, Sharia-compliant credit to low-income, rural, and women-headed households, thereby enhancing household resilience during economic shocks and supporting essential expenditures, such as medical education (Razak & Asutay, 2022; Célerier & Matray, 2019; Dawood et al., 2019; Fedro et al., 2019; Inoue, 2021). Its responsiveness and ease of access distinguish it from mainstream financial products, especially when families must manage large, lumpy educational fees or urgent healthcare costs (Wulandari & Kassim, 2015).

The inadequacy of formal credit channels for financing medical education reinforces the relevance of gold-backed pawning as a practical solution. Evidence shows that households frequently resort to pawning gold to meet tuition deadlines, fund clinical rotation expenses, or cover unanticipated educational and health-related financial needs when bank-based loans are inaccessible or unsuitable (Francois, 2006; Inoue, 2021; Nguyen & Floro, 2020; Raccanello et al., 2007). In this role, *Pegadaian* operates not only as a provider of short-term liquidity but also as a stabilizing institution that supports household financial resilience. Its sharia-compliant *rahn* and multi-contract financing models ensure ethical borrowing pathways for Muslim communities, while its extensive national coverage reduces geographic disparities in access to emergency financial services (Arifin & Hatoli, 2021; Célerier & Matray, 2019; Fedro et al., 2019).

Despite these advantages, important challenges remain. Households face risks related to asset loss, short repayment cycles, and information asymmetry, with financial literacy emerging as a critical moderator of responsible borrowing behavior (Lim et al., 2022; Sulistiyani et al., 2024; Woolley et al., 2024). Moreover, regulatory fragmentation and gaps in consumer protection continue to limit the full potential of gold-backed pawning as a sustainable education financing mechanism (Baradaran, 2020; Kassim et al., 2019). These constraints, coupled with the absence of longitudinal household-level studies on long-term educational outcomes, signify a substantial research and policy gap that warrants further investigation (Razak & Asutay, 2022; Gürgün & Ünalmiş, 2014; Zhou et al., 2016).

Gold's relevance to household financial resilience is further amplified by its unique material property as an infinitely recyclable resource. Whereas primary gold mining — particularly artisanal and small-scale operations — imposes considerable environmental costs through mercury contamination and land degradation (Kristensen et al., 2014; Afrifa

et al., 2019), the gold that circulates through pawning and redemption cycles is drawn almost entirely from existing household stock. This positions gold-backed pawning at the intersection of financial inclusion and sustainable resource management, a dimension that has received little attention in the existing literature on education financing.

Against this backdrop, this paper synthesizes theoretical and empirical evidence to examine how gold-backed pawning, particularly as implemented by Pegadaian, functions as a strategic financial inclusion mechanism capable of sustaining medical education for financially vulnerable households. By integrating insights from the economics of higher education, household finance, Islamic pawnbroking, and digital financial inclusion, the paper seeks to articulate a comprehensive understanding of the role of gold-backed pawning in supporting household resilience and educational continuity within Indonesia's rapidly evolving socio-economic context.

2. Methods

2.1 Research design and data sources

This study employed a narrative-conceptual review design to synthesise interdisciplinary evidence on the interaction between rising medical education costs, household financial pressures, and the role of gold-backed pawning as a financial inclusion mechanism. A narrative conceptual approach was selected because the research topic spans multiple domains, medical education financing, household finance, Islamic pawnbroking, and financial inclusion, where relevant evidence is dispersed across heterogeneous study designs rather than concentrated within a single empirical or methodological tradition. This approach enables the integration of theoretical, empirical, and policy-oriented insights into an interpretive framework explaining how Pegadaian's gold-backed pawning supports household financial resilience and educational continuity (Bachri, 2024; Dewanto, 2014; Hayati et al., 2025).

The evidence base was derived from a Scopus-based conceptual analytical dossier comprising 45 conceptually relevant studies published between 2010 and 2023. These references aggregated empirical investigations, policy analyses, and qualitative studies from Indonesia, Malaysia, and comparable emerging economies, addressing sharia-compliant pawning (*rahn/rahnū*), household borrowing behaviour, digital gold products, financial literacy, socioeconomic vulnerability, microfinance, and service quality within regulated pawnbroking institutions. To guide the identification of relevant literature, the following search string was employed: ("gold" OR "precious metal" OR "bullion") AND ("pawning" OR "collateral" OR "secured loan" OR "pawn shop") AND ("financial inclusion" OR "access to finance" OR "financial access" OR "economic inclusion") AND ("microfinance" OR "credit" OR "lending" OR "financial services") AND ("poverty alleviation" OR "economic empowerment" OR "wealth creation" OR "socioeconomic development"). This search strategy was designed to capture gold-related collateral mechanisms, their financial inclusion effects, and their intersections with microfinance and household socioeconomic resilience. Studies meeting conceptual relevance criteria were retained for thematic reading and synthesis, resulting in a final corpus of 45 Scopus-indexed references for analysis.

Second, contextual evidence from Indonesian literature on medical education financing, rising tuition and clinical training costs, and household financial stress was incorporated to refine the conceptual framing (Bachri, 2024; Dewanto, 2014; Hayati et al., 2025; Sadino & Rahmatullah, 2021). These sources elucidate the structural burden faced by households navigating prolonged medical training pathways, thereby situating gold-backed pawning within a broader context of education-related financial decision-making.

2.2 Literature selection criteria and synthesis approach

Literature selection followed a concept-driven inclusion strategy, prioritising materials that addressed: cost escalation and liquidity risks in medical education; gold as a liquid

household asset and emergency buffer; operational, economic, and socio-legal dimensions of Pegadaian's gold-backed pawning; and mechanisms of household financial resilience and emergency liquidity management.

All selected sources were subjected to thematic reading and inductive synthesis to identify convergent patterns, theoretical linkages, and structural mechanisms. The integrative synthesis informed the construction of a coherent analytical model describing how technology-enabled gold-backed pawning functions as a rapid-access, asset-based financing mechanism that mitigates short-term liquidity gaps and helps prevent educational disruption among financially vulnerable households. This methodological approach is widely employed in policy-oriented and interdisciplinary research due to its capacity to merge empirical evidence with theoretical argumentation and to generate analytically robust conceptual frameworks (Baumeister & Leary, 1997; Snyder, 2019).

3. Results and Discussion

3.1 Gold as a strategic household asset for medical education financing

3.1.1 Gold as a physical savings instrument in Indonesian households

Gold constitutes one of the most widely held physical savings instruments among Indonesian households due to its cultural familiarity, intrinsic value, portability, and low entry barriers. Many low- and middle-income families accumulate gold in small increments, often as jewelry or micro-bullion, because it does not require formal financial access or complex documentation, making it a natural vehicle for precautionary savings (Anggraini et al., 2023; Rosiyani & Hasyim, 2021). The Scopus evidence reinforces this pattern, showing that gold-backed pawning is disproportionately used by financially vulnerable groups, including low-income rural households and women-headed households, who rely on gold as a coping mechanism against income shocks (Célerier & Matray, 2019; Dawood et al., 2019; Fedro et al., 2019; Inoue, 2021). Gold's liquidity is strengthened by Pegadaian's extensive branch network, which enables families to convert gold into cash instantly, thereby integrating gold into their everyday household financial strategy. For households financing long-duration commitments such as medical education, this liquidity becomes central for navigating unexpected tuition deadlines, clinical rotation fees, and rising living costs Figure 1. However, because households often lack adequate financial literacy, gold's role as a savings vehicle can turn into a source of unintended loss if borrowers do not understand pawn-related costs, administrative fees, or their rights concerning collateral protection (Robiyanto & Djari, 2021; Rosiyani & Hasyim, 2021). This intersection between cultural practice, structural vulnerability, and accessible liquidity is what makes gold a strategic but also delicate financial asset for Indonesian households.

Gold's role as a strategic household asset is reinforced by its capacity to preserve value amid inflationary pressures and macroeconomic instability, while simultaneously serving as an accessible source of emergency liquidity. Empirical models of gold-price dynamics in Indonesia demonstrate that, despite short-term fluctuations, gold generally retains or even increases its real value during periods of economic uncertainty, functioning as a hedge against currency depreciation and rising living costs (Acnesya et al., 2025; Hutajulu & Agustina, 2024; Treisya & Robiyanto, 2021). International evidence further confirms that gold operates as a safe-haven asset in emerging market contexts, particularly when equity markets become volatile and household purchasing power deteriorates (Gürgün & Ünalmiş, 2014). For Indonesian households facing the escalating and long-term cost structure of medical education, this relative stability provides both financial and psychological reassurance, enabling families to hold gold as a medium-term financing reserve.

At the same time, the value-stability of gold does not eliminate short-run risks associated with price volatility. Evidence from the literature highlights that fluctuations in gold prices directly affect loan-to-value (LTV) ratios and redemption costs: temporary price declines reduce borrowing capacity, while sharp price increases raise the cost of reclaiming

pledged assets (Francois, 2006; Nguyen & Floro, 2020; Raccanello et al., 2007). Households with limited financial literacy may misinterpret these market dynamics, leading to poorly timed pawning decisions, repeated borrowing cycles, or unintended asset loss. Thus, while gold offers long-term inflation protection, its effective use as a financial buffer depends on borrowers' understanding of price movements and contractual implications.

Beyond its store-of-value function, gold's universal acceptability and predictable appraisal mechanisms make it a critical emergency liquidity buffer for Indonesian households. In contrast to bank-based kredit, which typically requires credit scoring, income verification, and lengthy administrative procedures, gold-backed pawning at Pegadaian provides immediate, sharia-compliant liquidity with minimal documentation requirements, a feature consistently identified in literature analyses as a core advantage for financially vulnerable borrowers (Fedro et al., 2019; Raccanello et al., 2007; Wulandari & Kassim, 2015). This immediacy is particularly vital when households confront urgent education- or health-related expenditures, allowing families to meet tuition deadlines, pay clinical rotation fees, or cover hospitalization costs without liquidating productive assets or resorting to high-interest informal lending (Robiyanto & Djari, 2021; Rosiyani & Hasyim, 2021).

The literature further demonstrates that gold-backed pawning enhances household financial resilience during shocks, especially among rural and women-headed households who face structural barriers in accessing formal credit markets (Razak & Asutay, 2022; Mgalamadzi & Chimombo, 2025). Nevertheless, the emergency-buffer function also entails inherent risks. Short loan tenors, fee accumulation, and repayment pressures may increase the likelihood of asset forfeiture if borrowers are insufficiently informed. Although financial education has been shown to improve responsible borrowing behavior, its protective effects tend to diminish without continuous reinforcement (Arsyianti & Kassim, 2018; İlbasmış et al., 2025; Lyons et al., 2006). Consequently, gold-backed pawning can function both as a lifeline and a source of vulnerability; its effectiveness as an emergency liquidity instrument ultimately depends on transparent institutional practices and sustained household financial literacy.

3.1.2 Relevance of gold in financing higher education

Gold's liquidity and collateral value make it especially relevant in financing higher education, where costs are rising and often irregular. Indonesian medical education, characterized by long study duration, intensive clinical requirements, and escalating tuition and living expenses, places sustained liquidity pressure on families (Bachri, 2024; Dewanto, 2014). Evidence confirms that gold-backed pawning is widely used as a financing tool for education-related expenditures, serving as a bridge when formal credit is unavailable or unsuitable due to strict eligibility requirements or high interest burdens (Francois, 2006; Inoue, 2021; Nguyen & Floro, 2020; Raccanello et al., 2007). For low- and middle-income households, pawning 10–20 grams of gold may provide sufficient liquidity to pay semester fees, purchase clinical materials, or sustain daily living costs during medical rotations. The literature report also emphasizes that Islamic microcredit frameworks, such as *ar-rahn*, provide lower service charges and greater accessibility for Muslim communities, making gold financing more inclusive (Hisham et al., 2013; Nik Azman et al., 2016, 2018; Zain et al., 2024).

However, to ensure that gold-backed financing remains sustainable and does not exacerbate financial vulnerability, transparent Loan-to-Value (LTV) mechanisms, fee disclosure, and consumer-protection practices are essential (Oktaviani et al., 2022; Robiyanto & Djari, 2021; Rosiyani & Hasyim, 2021). Incorporating gold-based emergency financing into educational policy frameworks for example, through structured emergency funds, subsidized storage fees, or university–Pegadaian partnerships—is therefore a promising strategy to reduce drop-out risks and strengthen household financial resilience.

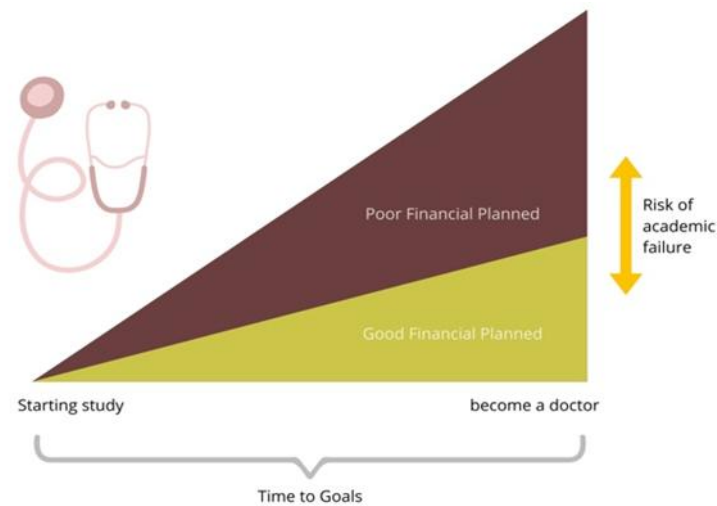


Fig. 1. Implementation of financial planning and the contribution of pawns to the reduction of the risk of failing studies in the faculty of medicine due to cost factors

3.2 Gold-backed pawning as a financial inclusion mechanism

3.2.1 Liquidity access without credit scores

Gold-backed pawning provides a rare form of collateral-based liquidity that does not rely on credit scoring or formal financial histories, a critical advantage in emerging economies where large segments of the population remain unbanked or underbanked. Pegadaian's operational model evaluates borrowers solely on the appraised value of the gold asset, enabling households with weak, informal, or non-existent credit records to obtain rapid liquidity for urgent expenditures, including tuition instalments, clinical rotation fees, and unexpected medical bills (Dirmawati & Putri, 2024; Syarif & Seto, 2023). Evidence from sharia-based pawning (*ar-rahn*) further confirms that collateral-backed lending expands credit access among low-income and women-headed households by bypassing traditional underwriting requirements and aligning with ethical, interest-free financing principles (Razak & Asutay, 2022; Fedro et al., 2019; Mgalamadzi & Chimombo, 2025).

Operationally, Pegadaian's streamlined process, minimal documentation, rapid appraisal, and transparent administrative fees create a faster and more predictable liquidity pathway than bank loans, which typically demand income verification, collateral registration, or credit scoring (Mazaqi & Istianah, 2024). This ease of access is especially important for families confronting lumpy and time-sensitive educational expenditures in medical schools. Nonetheless, protecting inexperienced borrowers requires clear disclosure of loan-to-value (LTV) ratios, service fees, redemption procedures, and dispute mechanisms to minimize the risks of hidden costs and predatory practices (Dirmawati & Putri, 2024; Syarif & Seto, 2023).

Loan-to-value (LTV) ratios guide the maximum advance a household can borrow against pledged gold. Pegadaian and other licensed institutions maintain standardized appraisal procedures that reflect gold purity, weight, and prevailing market prices, ensuring that credit disbursement remains proportional to the underlying collateral (Mazaqi & Istianah, 2024). This structure minimizes default risk for lenders while guaranteeing that borrowers retain equity in their assets. From the financial stability perspective, gold's global pricing benchmarks create a transparent basis for valuation, reinforcing borrower confidence and preventing arbitrary or exploitative pricing.

Fluctuations in global gold prices, however, can influence LTV ceilings and redemption ability: rising gold prices may increase borrowing capacity, whereas temporary price declines may tighten collateral requirements. Thus, financial literacy regarding price dynamics and their implications for redemption timelines is essential (Mazaqi & Istianah,

2024). Studies on consumer protection emphasize the importance of secure storage, insurance, transparent auction procedures, and legal safeguards to ensure that borrowers do not face undue asset-loss risks, an especially salient concern for households that leverage gold to protect the continuity of medical education (Atikah & Yunus, 2021; Kassim et al., 2019).

Gold-backed pawning through regulated institutions plays a crucial role in shielding financially vulnerable households from the exploitative dynamics of informal lending markets. Informal lenders often impose opaque fees, unregulated interest charges, and coercive collection practices. In contrast, Pegadaian's regulated framework, supported by sharia-based contracts, structured administrative fees, and transparent LTV calculation, offers a safer alternative for urgent liquidity needs (Dirmawati & Putri, 2024; Syarif & Seto, 2023).

Financial literacy is central in guiding households away from predatory lending. Knowledge of LTV, storage fees, extension charges, and redemption rights empowers borrowers to avoid debt traps and to optimize pawning as a short-term liquidity tool rather than a chronic financing mechanism (Sulistiyani et al., 2024). Regulatory recommendations, including standardized disclosure sheets, complaint-handling units, and digital LTV calculators, align with global consumer protection frameworks and are echoed in international pawning research that highlights the social risks of poorly regulated collateral lending (Edwards & Lomax, 2017; McGarity & Caplan, 2019).

Gold-backed pawning supports micro-entrepreneurs by providing quick working capital for inventory purchases, operations management, and short-term cash-flow stabilization. These effects are well documented in Indonesian and Malaysian *ar-rahn* literature, which reports increased resilience and productivity among women micro-entrepreneurs and rural business owners who lack access to formal bank loans (Dirmawati & Putri, 2024; Nik Azman et al., 2016, 2018; Susilowati et al., 2020; Syarif & Seto, 2023). Liquidity from pawning helps households smooth consumption during shocks, health emergencies, job interruptions, or tuition deadlines, reducing the need to sell productive assets or incur high-cost informal debt. Research on household finance underscores the importance of liquid assets in maintaining stability and preventing rapid descent into financial vulnerability (Lubis et al., 2019; Wijanarko et al., 2022).

Gold-backed pawning's contribution to educational financing is increasingly recognized. References and evidence demonstrate that households use pawnshops to bridge timing gaps in tuition payments, medical school practical modules, clinical rotation fees, and associated living costs when formal credit is inaccessible or too slow (Inoue, 2021; Zain et al., 2024). When integrated with scholarships, deferred payment schemes, or subsidized credit lines, pawning can reduce the risk of academic disruption, especially for low-income families navigating rising medical education costs (Mazaqi & Istianah, 2024; Syarif & Seto, 2023).

3.2.2 Policy and institutional implications

To maximize the financial inclusion benefits of gold-backed pawning, regulators must strengthen transparency standards around LTV, administrative fees, storage costs, extension charges, and debtor rights. Accessible LTV calculators, standardized cost disclosures, and clear redemption protocols can prevent information asymmetry and enhance consumer confidence (Dirmawati & Putri, 2024; Syarif & Seto, 2023). Public-private partnerships between Pegadaian, universities, and scholarship providers could formalize "gold-based emergency education financing windows," offering short-term liquidity for tuition or clinical training expenses. Such programs should be paired with targeted financial literacy training, given strong evidence that financial education improves borrowing discipline, though effects diminish without reinforcement (Arsyianti & Kassim, 2018; Carlin & Robinson, 2012; İlbasım et al., 2025; Lyons et al., 2006). Finally, additional empirical research especially longitudinal and household-level data is required to evaluate long-term outcomes, regional disparities, and gender-specific barriers in gold-backed

pawning usage (Gürkün & Ünalmiş, 2014; Kamble et al., 2025; Vargas-Hernandez et al., 2025; Zhou et al., 2016). Robust evidence will support future policy design and improve the protection of vulnerable borrowers.

Pegadaian's Characteristics: Fast, Safe, and Low-Barrier Access; Pegadaian's gold-backed pawning system remains one of Indonesia's most crucial emergency financing channels due to its unique combination of speed, simplicity, and regulatory safeguards. Unlike conventional bank credit, which requires documented income, credit scoring, and multi-stage approval, Pegadaian offers rapid assessment based solely on the appraisal of gold collateral, enabling families to obtain liquidity within hours rather than days (Dirmawati & Putri, 2024; Mazaqi & Istianah, 2024; Syarif & Seto, 2023). Analysis of the literature evidence confirms that responsiveness is the strongest determinant of customer satisfaction among low-income users, far exceeding assurance or reliability, demonstrating how time-critical liquidity fundamentally shapes borrower experience (Wulandari & Kassim, 2015).

In terms of safety, Pegadaian's sharia-compliant *rahn* framework ensures that pledged gold remains legally owned by the borrower, while the institution acts as custodian with clear obligations regarding storage, maintenance, and transparent auction procedures in cases of non-redemption. Regulatory oversight and standardized operational procedures further enhance consumer trust, distinguishing Pegadaian from informal lenders whose practices often lack transparency and legal accountability (Dirmawati & Putri, 2024; Syarif & Seto, 2023). Evidence from Scopus highlights Pegadaian's sharia compliance and risk-management system supported by DSN-MUI (Dewan Syariah Nasional – Majelis Ulama Indonesia) fatwas and multi-contract structures as a key pillar ensuring ethical, fair, and secure financial transactions (Atikah & Yunus, 2021; Fedro et al., 2019; Hidayati & Hidayatullah, 2021). Minimal documentation requirements, transparent cost structures, and consistent service quality therefore position Pegadaian as a vital financial institution for households facing urgent educational, health, or livelihood-related shocks.

Emergency Educational Financing: Tuition Arrears, Clinical Rotations, Certification, and Mobility Costs. Pegadaian's gold-backed pawning mechanisms provide rapid financial bridging for families struggling with urgent educational expenses, an increasingly relevant function given the escalating cost structure of medical education in Indonesia. When households face tuition arrears (*Uang Kuliah Tunggal/UKT*), unpaid clinical rotation fees, costs of mandatory clinical modules, certification assessments, or sudden transportation needs for hospital placements, gold-backed pawning offers liquidity without requiring a formal credit history (Mazaqi & Istianah, 2024; Syarif & Seto, 2023). Scopus findings confirm that gold pawning is widely used to manage large, time-sensitive expenditures in medical education, particularly because formal credit channels remain inaccessible or unsuitable for low-income families (Francois, 2006; Inoue, 2021; Nguyen & Floro, 2020; Raccanello et al., 2007).

The borrower's financing capacity is determined by the LTV ratio, enabling predictable access to short-term cash that prevents academic disruption during financially sensitive periods. Because medical education involves repeated "lumpy" costs textbooks, examinations, clinical uniforms, and rotations across hospitals Pegadaian's role becomes essential in smoothing household cash flow. However, maximizing effectiveness requires literacy on LTV, administrative fees, and redemption rights to avoid excessive rollover cycles or misallocation of funds, a concern highlighted in both Indonesian literature and Scopus evidence on the risks of short-term pawning in education financing (Razak & Asutay, 2022; Lim et al., 2022; Woolley et al., 2024).

3.3 Health-related emergencies: Hospitalization, surgery, medication

Health shocks such as sudden hospitalization, emergency procedures, or urgent pharmaceutical needs represent major triggers for household borrowing in emerging economies. Gold-backed pawning provides a rapid, collateral-based solution that enables families to secure funds when delays in care could worsen clinical outcomes (Dirmawati &

Putri, 2024; Mazaqi & Istianah, 2024; Syarif & Seto, 2023). The literature documents that pawning is internationally used for coping with health-related financial shocks, with evidence showing that reliance increases during illness episodes and that timely access to pawning reduces the likelihood of catastrophic spending or postponed treatment (Raccanello et al., 2007).

Because health emergencies often coincide with household income loss or sudden costs (e.g., labs, imaging, antibiotics), Pegadaian's speed becomes decisive. Rapid appraisal and disbursement allow families to bypass lengthy loan procedures, relieving immediate pressure while maintaining asset ownership. Yet, as highlighted in both local and international studies, borrowers must understand fee structures administrative, storage, extension and the risks of repeated rollovers; otherwise, health shocks may transition into long-term financial strain (Dirmawati & Putri, 2024; Syarif & Seto, 2023). Policies promoting LTV transparency, standardized disclosures, and stigma-free promotion of health-related pawning are essential to ensuring ethical and effective use of the system for medical emergencies.

Empirical studies consistently demonstrate that gold-backed pawning functions as a primary risk-coping mechanism for households facing emergency needs related to education, health, and small-scale economic activity in Indonesia and comparable emerging economies (Dirmawati & Putri, 2024; Mazaqi & Istianah, 2024; Syarif & Seto, 2023). Evidence synthesised from the literature situates pawnbroking as a stabilising financial institution across historical and contemporary contexts, from early twentieth-century Japan's household risk-management strategies to present-day Southeast Asia, where persistent gaps in formal credit markets heighten reliance on collateralised liquidity (Francois, 2006; Inoue, 2021; Nguyen & Floro, 2020). Within this context, gold's universal acceptability and predictable valuation underpin its continued relevance as an emergency financial instrument.

In Indonesia, Pegadaian's wide accessibility, legal legitimacy, availability of sharia-compliant products, and transparent loan-to-value (LTV) mechanisms have positioned gold pawning as a preferred tool for smoothing household cash flow. Households commonly rely on pawned gold to meet school and university payment deadlines, handle urgent medical care costs, supply short-term working capital for micro-enterprises, and buffer income fluctuations associated with informal-sector employment. These usage patterns highlight the multifunctional role of gold-backed pawning in sustaining educational continuity, protecting household health, and supporting livelihoods during periods of financial stress, particularly when alternative sources of formal credit are unavailable (Dirmawati & Putri, 2024; Mazaqi & Istianah, 2024; Syarif & Seto, 2023).

The literature further indicates that women-headed households and rural families rely disproportionately on gold-backed pawning, reflecting its importance as an inclusive financial access channel for populations facing structural barriers to bank-based credit (Razak & Asutay, 2022; Sulistiyani et al., 2024). Pegadaian's extensive national network, comprising thousands of branches across semi-urban and rural regions, reinforces this inclusivity by ensuring access to emergency liquidity in geographically isolated areas. However, Scopus evidence also underscores persistent risks related to repeated borrowing cycles, fee accumulation, and insufficient financial literacy, which may heighten vulnerability if left unaddressed (Arsyianti & Kassim, 2018; Carlin & Robinson, 2012; İlbasım et al., 2025; Lyons et al., 2006). Consequently, several studies advocate for coordinated policy efforts that integrate Pegadaian services with educational assistance schemes, rural entrepreneurship support, and local government social protection programmes to strengthen household resilience and advance inclusive finance and equitable access to education (Dirmawati & Putri, 2024; Syarif & Seto, 2023).

3.3.1 Geographic reach and rural financial inclusion

Pegadaian's extensive national network, including thousands of branches in semi-urban and rural regions, makes it one of Indonesia's most geographically inclusive financial

institutions. This distribution ensures that households in remote areas, often underserved by banks and microfinance institutions, can still access emergency liquidity for education, health, and enterprise needs (Dirmawati & Putri, 2024; Mazaqi & Istianah, 2024; Syarif & Seto, 2023). Literature evidence supports the view that rural and low-income households benefit disproportionately from pawning, given structural credit constraints and limited access to formal financial services (Razak & Asutay, 2022; Sulistiyani et al., 2024).

The presence of Pegadaian outlets in geographically isolated areas helps reduce dependence on informal lenders and promotes economic resilience by enabling UMKM continuity, stabilizing household consumption, and supporting education financing. This aligns with findings in financial inclusion literature that emphasize the importance of accessible physical financial infrastructure in improving economic well-being and poverty reduction. Furthermore, coordinated policy efforts, such as integrating Pegadaian services with educational assistance programs, rural entrepreneurship support, or local government social protection schemes, could amplify regional impacts and advance SDG targets related to inclusive finance and equitable access to education (Dirmawati & Putri, 2024; Syarif & Seto, 2023).

3.3.2 Gold-backed pawning as a pillar of medical education sustainability

Analysis of the Cost Burden of Medical Education: Medical education in Indonesia is characterized by a prolonged, multi-stage cost structure that includes tuition, laboratory modules, clinical clerkship, professional certification, transportation across training sites, textbooks, instruments, and rising living expenses. This cumulative financial load, which increases with inflation and expanding clinical training requirements, places intense liquidity pressure on households, especially those in the lower- and middle-income segments (Bachri, 2024; Dewanto, 2014; Sadino & Rahmatullah, 2021). Empirical evidence from the Scopus literature confirms that households experiencing education-related financial shocks are more likely to depend on collateralized microfinance solutions, including gold pawning, due to the immediacy and accessibility of such financing compared with bank-based credit (Francois, 2006; Inoue, 2021; Nguyen & Floro, 2020; Raccanello et al., 2007).

The economic risk of study interruption is substantial: delays in tuition payment or unmet clinical rotation fees can delay modules, extend study duration, or even lead to dropout. For financially constrained households, the absence of liquid emergency funds amplifies vulnerability, making gold-backed pawning an attractive liquidity bridge to secure continuity during critical phases of medical training (Bachri, 2024; Dewanto, 2014). Policy implications point toward the need for integrated financing models that combine scholarships, soft-loan schemes, and gold-based emergency liquidity, supported by financial literacy programs to help families plan expenditures across the long arc of medical education.

Conventional banks and educational microcredit programs such as KUR Pendidikan often impose strict eligibility criteria—formal income proof, credit scoring, collateral documentation—that exclude many low-income and informal-sector households. Long processing times and high administrative burdens further reduce their suitability for time-sensitive medical education costs (Robiyanto & Djari, 2021; Rosiyani & Hasyim, 2021). (Rosiyani & Hasyim, 2021; Syarif & Seto, 2023; Dirmawati & Putri, 2024). The evidence reinforces this structural barrier: borrowers in the lowest socioeconomic brackets consistently turn to pawnshops because formal financial products are slow, inaccessible, or mismatched with their urgent liquidity needs (Razak & Asutay, 2022; Célerier & Matray, 2019; Dawood et al., 2019; Mgalamadzi & Chimombo, 2025).

International microfinance research adds nuance. Although microcredit can improve general school enrollment, systematic reviews show inconsistent evidence for improved enrollment among girls and mixed outcomes regarding long-term welfare, especially when credit is taken without complementary financial education (Ali et al., 2016; Cruz et al., 2023; Duvendack & Mader, 2019). In some cases, microcredit even increases the household debt

burden. Thus, gold-backed pawning, with its collateral-based, no-credit-score model, fills an institutional vacuum by offering fast liquidity while avoiding the structural exclusion embedded in bank-based education loans. Strengthening transparency, LTV clarity, and consumer protection can further ensure that gold pawning remains a safe and inclusive option for families unable to meet bank requirements (Dirmawati & Putri, 2024; Syarif & Seto, 2023).

Gold functions as a stabilizing liquidity buffer that prevents academic disruption by enabling students to meet essential financial obligations when household cash flow falters. Through Pegadaian's rapid appraisal and minimal documentation processes, families can quickly access emergency funds to cover tuition instalments, clinical modules, koas rotations, mobility requirements, and certification fee expenses that, if unmet, could delay or interrupt academic progression (Dirmawati & Putri, 2024; Syarif & Seto, 2023). Literature evidence confirms that low-income households commonly use gold pawning to absorb temporary liquidity shocks related to education, a finding consistent with broader international evidence on pawnbroking as a risk-coping mechanism for essential services (Francois, 2006; Inoue, 2021; Nguyen & Floro, 2020; Raccanello et al., 2007).

In the health domain, gold likewise serves as an emergency reserve for medical treatment that, if delayed, could impair a student's ability to continue studying due to illness or unplanned caregiving responsibilities. The decentralized nature of Pegadaian's network enhances accessibility in both urban and rural settings. However, to prevent pawn overuse and asset depletion, students and families need clear education on LTV structures, administrative fees, renewal conditions, and redemption rights. Financial literacy thus becomes the linchpin ensuring that pawning serves as a temporary stabilizer—not a long-term financial trap. Case Illustration: 10–20 Grams of Gold Covering Key Medical School Costs.

A practical scenario illustrates gold's relevance in medical education financing: a household holding 10–20 grams of gold can access a substantial, immediate loan depending on prevailing gold prices and institutional LTV ratios. With LTV typically around 70–80%, such a pledge can yield liquidity sufficient to cover partial tuition fees (*Uang Kuliah Tunggal/UKT*), koas modules, or several months of living costs during hospital rotations (Dirmawati & Putri, 2024; Syarif & Seto, 2023). The evidence from the literature echoes the same mechanism, showing that small gold assets often function as micro-reserves that households deploy to smooth expenses in education, health, and microenterprise contexts (Francois, 2006; Inoue, 2021; Nguyen & Floro, 2020). However, the net financial benefit depends on gold price dynamics, administrative charges, and the borrower's ability to redeem the asset within the loan tenor. Misjudging these factors can lead to higher effective costs or asset loss. Thus, tools such as digital LTV calculators, transparent cost breakdowns, and counseling services are essential to enable responsible use of pawn-based financing for educational continuity.

Internationally, gold-based microfinance and collateral-backed lending have been explored as inclusive financing tools; however, their empirical impacts vary. Conceptually, gold pawning allows low-income households to access credit without formal scoring, while retaining ownership of the underlying asset. However, systematic reviews of microfinance show mixed effects: some programs increase school enrollment and improve household resilience, but others generate debt stress when not paired with grants, scholarships, or financial education (Ali et al., 2016; Duvendack & Mader, 2019; Nawaz, 2010). Scopus evidence supports this heterogeneity, noting that outcomes depend heavily on borrower protection, transparency, and the ethical structure of lending models, including sharia-based pawning systems that emphasize fairness and equitable pricing (Hisham et al., 2013; Nik Azman et al., 2016, 2018; Zain et al., 2024).

Policy lessons are clear: gold-backed educational financing must be embedded within a broader ecosystem of support including scholarships, income-based repayment options, emergency grants, and structured financial literacy so that pawn-based borrowing acts as a buffer rather than a long-term debt burden. Collaboration between pawnshops, medical schools, and government agencies could institutionalize gold-based emergency funds,

accompanied by counseling services and consumer safeguards. Future research should employ longitudinal, quasi-experimental, or experimental designs to evaluate the impact of gold-backed financing on medical student retention, household financial stability, and the reduction of educational inequality (Ali et al., 2016; Duvendack & Mader, 2019).

3.4 Innovative gold-based models for education financing

3.4.1 Integration of Pegadaian digital services (e-gadai)

The digital transformation of Pegadaian's gold-backed services represents an important leap in expanding financial inclusion, particularly for households that require immediate educational or health-related liquidity. Pegadaian Digital enables electronic pawning through end-to-end digital workflows—online registration, remote identity verification, digital gold valuation, and real-time transaction reporting—which significantly reduces administrative delays that traditionally accompany physical branch transactions (Bahari et al., 2021; Humaira, 2018). Findings from the literature emphasize that digital gold products attract younger, tech-savvy users and reshape financial behaviors by offering convenience, platform transparency, and secure storage options (Prasarry et al., 2023; Sujit et al., 2025; Sulistiyani et al., 2024). This shift toward digital adoption aligns with broader financial inclusion strategies that prioritize accessibility and responsiveness, key determinants of customer satisfaction among low-income households (Wulandari & Kassim, 2015).

Digitalization also reduces operational costs through automation and widens access for non-urban households who face geographical barriers to physical branches. Studies on financial inclusion underline that digital interfaces can overcome structural limitations in rural settings by providing remote access to liquidity services that were previously restricted by travel distance and service hours (Bahari et al., 2021; Humaira, 2018). Nevertheless, the expansion of e-gadai services must be matched with robust consumer protection frameworks and digital financial literacy, particularly concerning LTV, administrative fees, and redemption rights, to prevent misuse or over-indebtedness. The literature evidence similarly stresses that regulatory clarity, cybersecurity, and consumer education are essential to ensure responsible use of digital gold platforms (Andenas & Giustiniani, 2024; Okoli, 2024).

The Gold-for-Education Model (Proposed Innovation): The proposed Gold-for-Education model integrates long-term gold savings with short-term educational financing through an automatic conversion mechanism. In this model, families accumulate gold progressively via regulated gold savings accounts and—when confronted with essential educational expenses such as tuition installments, clinical rotation fees, modules, or certification costs part of the accumulated gold is automatically converted into a structured education loan based on a predetermined LTV ratio. This approach combines disciplined saving behavior with immediate access to collateralized liquidity, consistent with the Literature findings that gold-backed pawning is particularly effective in sustaining large, lumpy expenditures such as medical education (Francois, 2006; Inoue, 2021; Nguyen & Floro, 2020; Raccanello et al., 2007).

Operationalizing the scheme requires transparent LTV calculators, clear administrative fees, and redemption pathways that ensure borrower protection. Digital ecosystems such as Pegadaian Digital can facilitate automated monitoring of gold balance, valuation updates, and repayment status. However, the model must incorporate safeguards such as caps on borrowing, volatility buffers, and systematic disclosure of costs to avert consumer risk in periods of short-term gold price fluctuations. International literature on gold-based microfinance warns that inadequate disclosure and weak protection can exacerbate borrower vulnerability, especially among low-income and female-headed households (Bahari et al., 2021; Duvendack & Mader, 2019; Humaira, 2018). Empirical evidence from the literature further highlights the need for strong sharia-based risk management and

contract clarity within multi-contract models such as *murabahah-rahn* frameworks (Arifin & Hatoli, 2021; Fedro et al., 2019; Hidayati & Hidayatullah, 2021).

A three-tiered financial safety net, gold *waqf*, gold savings, and gold-backed pawning offers a synergistic model for strengthening household financial resilience and supporting the sustainability of medical education. The Gold *waqf* provides the long-term philanthropic foundation for educational scholarships, research funding, and clinical training subsidies. Gold savings accounts, widely used across Pegadaian and Islamic financial institutions, promote disciplined asset accumulation and enhance household capacity for planned educational investment. Gold pawning, as demonstrated extensively in the Scopus evidence, provides a rapid liquidity mechanism during shocks, enabling households to cover urgent educational or health-related expenses without liquidating long-term assets (Inoue, 2021; Kassim et al., 2019; Raccanello et al., 2007).

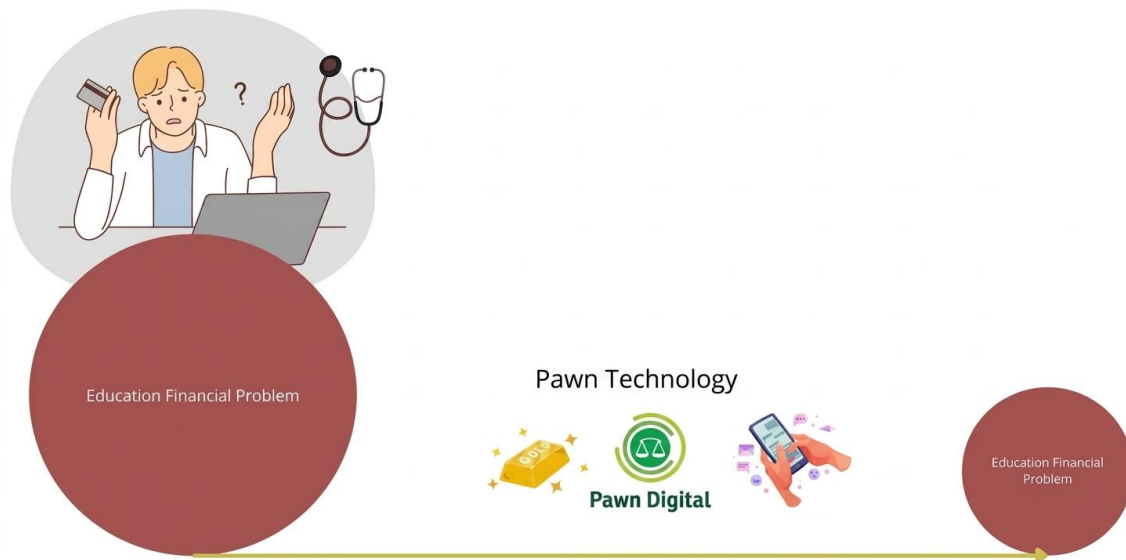


Fig. 2. Technology-enabled gold-backed pawning as an emergency liquidity pathway for education-related financial stress

This layered model aligns closely with Islamic finance principles such as *rahn* and *ijarah*, which offer ethical, collateral-based financing accessible to low-income households. Empirical studies show that *ar-rahn* schemes contribute meaningfully to financial inclusion and women's economic participation by providing secure, collateralized credit without dependence on conventional credit scoring systems (Razak & Asutay, 2022; Nik Azman et al., 2016, 2018). Implementing the combined model requires transparent governance, standardized gold valuation, sharia-compliant accounting frameworks, and consumer protection mechanisms. Practical implementation may include channeling gold *waqf* into scholarship endowments, linking gold savings with automatic education loan triggers, and enabling gold pawning as an emergency buffer during financial shocks (Bahari et al., 2021; Ratna, 2023; Sholeha et al., 2025).

3.4.2 Collaboration opportunities: Pegadaian, universities and government ministries

Strategic partnerships between Pegadaian, medical universities, and relevant ministries (Education, Finance, Religious Affairs) can institutionalize gold-based financing as a safety net for medical students, especially those from low-income or rural households. Pegadaian can extend dedicated education-linked pawning products, both conventional and sharia-compliant, to university ecosystems, allowing students to access emergency liquidity through integrated e-gadai platforms equipped with transparent LTV calculators, standardized fee structures, and on-campus service touchpoints. This aligns with evidence that responsiveness, accessibility, and transparency are the main determinants of satisfaction for financially vulnerable users (Wulandari & Kassim, 2015).

Universities and ministries could also co-develop gold-backed scholarship pools, integrating gold *waqf* donations, alumni contributions, and institutional endowments to sustain long-term educational support. From a policy perspective, ministries can strengthen digital financial inclusion through regulatory clarity, consumer protection frameworks, and targeted incentives for gold-based educational finance programs, echoing from literature recommendations emphasizing regulatory innovation, fraud prevention, and strengthened disclosure requirements (Baradaran, 2020; Kassim et al., 2019; McGarity & Caplan, 2019; Zulfiqar, 2017).

Furthermore, embedding financial literacy modules within medical curricula can reinforce responsible borrowing behaviors, as multiple studies have shown that the effects of financial education decay without continuous reinforcement (Arsyianti & Kassim, 2018; Carlin & Robinson, 2012; İlbasım et al., 2025; Lyons et al., 2006). Paired with Pegadaian's digital analytics, universities could monitor student utilization patterns to ensure that gold-based financing remains a protective mechanism rather than a source of over-indebtedness.

3.5 Discussion

A central challenge in scaling gold-backed pawning as a financial inclusion instrument lies in persistently low levels of financial literacy among low- and middle-income households. Evidence from Indonesia indicates that borrowers with limited understanding of loan-to-value (LTV) ratios, administrative fees, effective interest components, or redemption rights are significantly more likely to make suboptimal financial decisions, including repeated pawning cycles that inflate long-term borrowing costs (Anggraini et al., 2023; Damayanti & Zakarias, 2020). Analysis reference findings corroborate this pattern, showing that the protective effect of financial education diminishes considerably without continuous reinforcement, thereby weakening its ability to safeguard borrowers over time. As a result, households may underestimate cumulative charges or misinterpret repayment implications, widening inequality in access to safe credit and increasing vulnerability to cost shocks associated with medical education (Rosiyani & Hasyim, 2021).

Short-term gold price volatility constitutes a second major risk for pawn-dependent households. Although gold is widely recognized as a stable long-term store of value, short-run price fluctuations directly affect collateral valuation, LTV ceilings, and redemption burdens (Acnesya et al., 2025; Hutajulu & Agustina, 2024; Treisya & Robiyanto, 2021). Empirical research shows that falling gold prices reduce borrowing capacity or require additional top-ups upon contract renewal, whereas sudden price increases elevate redemption costs and generate unexpected liquidity stress. Scopus evidence similarly indicates that gold's safe-haven status does not eliminate short-term volatility, which can distort borrower expectations and exacerbate repayment difficulty (Gürgün & Ünalmiş, 2014). Households with weak financial planning skills are disproportionately exposed to these timing mismatches, highlighting the importance of borrower education on price cycles and redemption mechanics.

A further structural concern is the risk of overdependence on pawning as a primary liquidity strategy. Recurrent reliance on pawn-based financing particularly among financially fragile households can create a cycle of short-duration loans, administrative charges, and increased likelihood of asset forfeiture (Robiyanto & Djari, 2021; Rosiyani & Hasyim, 2021). The studies show that although pawnshops, including sharia-compliant *ar-rah*n institutions, enhance inclusion and women's economic participation, habitual borrowing increases repayment pressure and reduces long-term savings incentives (Edwards & Lomax, 2017). This risk is acute in the context of medical education, where multi-year and escalating cost structures may push families toward repetitive short-term borrowing in the absence of structured financial support.

Transparency gaps in LTV rules, fee structures, and consumer protection frameworks further amplify these vulnerabilities. Many borrowers have limited understanding of administrative costs, storage fees, appraisal charges, penalties, and renewal terms—cost elements that can accumulate subtly yet substantially over time (Robiyanto & Djari, 2021;

Rosiyani & Hasyim, 2021). Evidence from the literature highlights inconsistent contract clarity, fragmented regulation, and insufficient disclosure requirements across pawn institutions (McGarity & Caplan, 2019). Moreover, studies show that customer satisfaction is driven more by service responsiveness than contract comprehension, suggesting that speed often supersedes informed decision-making (Wulandari & Kassim, 2015). This underscores the urgent need for standardized disclosure tools, such as simplified LTV calculators, transparent cost tables, and explicit statements of consumer rights.

Finally, broader policy and institutional limitations present systemic risks that must be addressed to balance inclusion with protection. The analysis references unresolved regulatory ambiguities in sharia-based pawning models, inconsistent risk-management standards, and technological disparities that limit access to digital gold products (Andenas & Giustiniani, 2024; Okoli, 2024). Vulnerable populations including rural households, women, and informal workers are disproportionately affected due to limited digital access and low bargaining power (Mgalamadzi & Chimombo, 2025). Policy interventions must therefore prioritize contract standardization, enforceable consumer-protection protocols, transparent dispute-resolution mechanisms, and integration of financial literacy into both traditional and digital pawning channels (Anggraini et al., 2023; Damayanti & Zakarias, 2020; Oktaviani et al., 2022). Equally important is the need for coordinated programs linking government agencies, Pegadaian, and higher-education institutions to ensure that gold-backed financing remains a safe and sustainable support system for education and healthcare expenditures. As repeatedly emphasized in the literature, the absence of longitudinal, household-level data significantly limits evidence-based policy design, underscoring the need for future panel studies and policy experimentation to refine interventions (Kamble et al., 2025; Zehra & Singh, 2023).

Situating gold-backed pawning within sustainable development discourse also requires acknowledging its dual resource character. As a household asset, gold provides not only economic resilience but also — through its recirculation via pawning and redemption — a form of resource stewardship that reduces reliance on environmentally costly primary extraction. Policies that encourage responsible sourcing disclosure, formalize recycled-gold tracking within Pegadaian's auction system, or link gold-backed education financing with broader green and circular economy targets could strengthen the institution's contribution to Indonesia's sustainable development agenda, beyond its established role in financial inclusion.

3.6 Limitations and implementation considerations

While gold-based financing innovations hold significant promise, several limitations merit careful consideration. Many recommendations remain conceptual due to gaps in longitudinal, household-level data assessing long-term impacts on medical education outcomes—an evidence gap explicitly identified in the literature analysis (Razak & Asutay, 2022; Gürgün & Ünalmiş, 2014; Zhou et al., 2016). Variation in regional gold prices, LTV policies, and branch-level service quality further complicates implementation across Indonesia's heterogeneous socio-economic landscapes. The digital divide, especially in rural areas, could also hinder the equitable uptake of e-gadai services unless supported by infrastructure investment and digital literacy programs.

Additionally, consumer protection, transparent contract design, and cybersecurity safeguards must be prioritized as Pegadaian expands its digital and hybrid financial products. Innovations must therefore be introduced gradually through pilot projects jointly managed by universities, Pegadaian, and ministries, accompanied by continuous monitoring and evaluative research.

This study is subject to several limitations inherent to the available evidence base. First, much of the literature synthesised originates from Indonesia and Malaysia, which limits the generalisability of findings to other emerging economies with different regulatory, cultural, and financial environments. Second, longitudinal household-level data examining the long-term effects of gold-backed pawning on financial resilience and educational outcomes

remain scarce, constraining the ability to assess cumulative risks such as repeated borrowing cycles, asset loss, and repayment stress. Third, existing research on digital gold products disproportionately reflects the behaviour of younger and urban users, leaving rural and digitally constrained populations underrepresented. Fourth, gendered and intersectional analyses remain limited, despite indications that women and marginalised groups face distinct barriers in accessing gold-backed financial services. Finally, rapid regulatory and technological developments in the pawning and digital-finance sectors mean that some findings may not fully capture the most recent policy and fintech innovations. Future research should therefore prioritize longitudinal designs, gender-responsive analytical frameworks, and impact evaluations of digital and Sharia-compliant pawning innovations to support more robust, evidence-based policy formulation.

3.7 Gold-backed pawning within the circular gold economy: An environmental sustainability perspective

Beyond its function as a household liquidity instrument, gold-backed pawning carries an underexplored environmental dimension that positions it within the broader discourse on sustainable resource management. Unlike newly mined gold, the gold pledged and redeemed through Pegadaian's *rahn* mechanism is almost entirely secondary gold — jewelry and bullion that already circulates within household wealth rather than gold extracted from new mining activity. This distinction matters because primary gold extraction, particularly through artisanal and small-scale gold mining (ASGM) that supplies a substantial share of global output, is associated with severe ecological and public-health externalities, including large-scale mercury use, contamination of soil and waterways, deforestation, and elevated greenhouse gas emissions per unit of output (Kristensen et al., 2014; Zolnikov & Ortiz, 2018; Afrifa et al., 2019). Estimates suggest that ASGM alone accounts for a substantial share of global anthropogenic mercury emissions, underscoring the scale of environmental harm embedded in primary gold supply chains.

By contrast, gold is one of the few commodities that can be recycled indefinitely without loss of quality, and a meaningful share of global annual gold supply already originates from recycled sources rather than new mining. Every cycle of pawning and redemption through Pegadaian effectively keeps household gold stock in continuous circulation rather than idle, while every case of non-redemption channels pledged gold into the formal secondary (recycled) gold market through regulated auction mechanisms, rather than into informal, unregulated resale. In this sense, Pegadaian's gold-backed pawning system functions as an informal but structurally significant node within Indonesia's circular gold economy: it recirculates existing household gold stock to meet urgent liquidity needs including medical education financing without generating additional demand for newly mined gold and its associated environmental footprint.

This reframing situates gold-backed pawning not merely as a household coping mechanism, but as a resource-efficient financing model consistent with circular economy principles: maximizing the utility of an already-extracted, non-degrading asset across multiple economic functions (store of value, collateral, emergency liquidity, and eventually secondary market supply) instead of relying on virgin resource extraction. Embedding this circularity explicitly within Pegadaian's institutional narrative and within policy design for instance, by tracking and reporting the share of pawned gold that is redeemed versus recirculated through formal auction into the recycled gold supply chain would allow gold-backed education financing to be evaluated not only through a financial-inclusion lens, but also through an environmental-impact and sustainable-resource-management lens, aligning it with green economy objectives.

Nevertheless, this environmental co-benefit should not be overstated. Because Pegadaian's system operates in parallel with, rather than as a substitute for, primary gold mining and jewelry retail markets, its net effect on reducing demand for newly mined gold is likely modest and has not been empirically quantified in the literature reviewed. Future empirical work — for example, tracking the proportion of Pegadaian's auctioned (non-

redeemed) gold that re-enters formal recycling channels versus informal resale — would be needed to substantiate the magnitude of this circular economy contribution, rather than treating it as an assumed benefit.

4. Conclusions

Gold-backed pawning, as practiced by Pegadaian, plays a strategically important role in supporting household financial resilience and sustaining long-term investments, such as medical education, in Indonesia. Conceptually, this study reframes gold-backed pawning from an ad hoc household coping strategy into a structured, institutionally mediated education-financing mechanism, articulated through the proposed Gold-for-Education model. By providing rapid, collateral-based liquidity without reliance on credit scoring, Pegadaian's hybrid conventional-sharia framework enables households, particularly low- and middle-income families, to stabilise cash flow, absorb financial shocks, and maintain educational continuity during periods of acute financial stress. Beyond its conceptual contribution, this study highlights several policy-relevant implications. The expansion of digital gold and e-gadai platforms has enhanced accessibility for younger and technology-oriented users, while conventional pawning services remain critical for rural and women-headed households facing persistent barriers to formal finance.

Nevertheless, the effectiveness of gold-backed pawning depends heavily on transparent loan-to-value (LTV) mechanisms, robust consumer protection standards, and sustained financial literacy interventions, given strong evidence that literacy gains tend to decay over time and that information asymmetries remain substantial. Beyond its financial inclusion function, gold-backed pawning also offers a modest but conceptually important contribution to sustainable resource management, insofar as it recirculates existing household gold stock rather than generating additional demand for environmentally costly primary gold extraction — a dimension that merits further empirical attention within Indonesia's broader green economy agenda. Coordinated policy collaboration among Pegadaian, universities, and government agencies could institutionalize gold-backed educational support systems, such as emergency liquidity channels aligned with tuition schedules, thereby strengthening human capital formation and reinforcing household financial resilience in Indonesia and comparable low- and middle-income settings.

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