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Beyond Household Wealth: Women's Land and House Ownership and Healthcare Access Barriers in Bangladesh

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Abstract

Background

Household wealth is widely used to study women's healthcare access, but it does not capture who controls resources within the household. Women's own ownership of land or housing may represent a distinct form of resource control. This study examines whether women's any sole and joint-only ownership of land or housing are associated with healthcare access barriers among currently married women in Bangladesh.

Methods

Data came from the 2022 Bangladesh Demographic and Health Survey. The analytical sample included 18,954 currently married women aged 15–49 in 674 clusters. Outcomes were self-reported barriers to seeking medical care: permission, money, distance, and going alone. Composite outcomes measured any barrier and multiple barriers. The exposure was women's land or house ownership, classified as no ownership, joint-only ownership, and any sole ownership. Survey-weighted logistic regression models, barrier-specific models, multilevel models, Wald tests, average marginal effects, and E-value sensitivity analyses were estimated.

Results

Most women reported no land or house ownership; 3.7% reported joint-only ownership and 5.5% reported any sole ownership. In fully adjusted survey-weighted models, sole ownership was associated with lower odds of any barrier (OR = 0.777, 95% CI: 0.662–0.912) and multiple barriers (OR = 0.743, 95% CI: 0.629–0.877). Joint-only ownership was associated with lower odds of any barrier but not multiple barriers. Barrier-specific results suggested that sole ownership was associated with both financial or access-cost barriers and autonomy-related barriers, while joint-only ownership was mainly associated with the money barrier. However, Wald tests provided limited evidence that sole and joint-only coefficients differed. Community moderation was suggestive but specification sensitive.

Conclusions

Women's own land or house ownership is associated with fewer healthcare access barriers in Bangladesh beyond household wealth. Causal interpretation requires longitudinal or quasi-experimental evidence.

1. Introduction

Barriers to healthcare access remain a major constraint on women's health and autonomy in Bangladesh. The Bangladesh Demographic and Health Survey (BDHS) documents four common difficulties that currently married women may face when they are sick and need medical advice or treatment: obtaining permission to go, securing money for treatment, reaching a health facility, and not wanting to go alone (NIPORT & ICF, 2024). Recent analyses of BDHS data show that these barriers are socially patterned. Women with lower education, lower household living standards, rural residence, and less-educated husbands are more likely to report healthcare access barriers [1, 2]. These findings are important, but they share a common limitation. Economic status is measured mainly through household-level indicators, especially the DHS wealth index. Such indicators capture the household's overall asset position, but they do not show who controls resources within the household.

This distinction matters. Two women living in households with similar wealth may face different healthcare access constraints if one personally owns land or housing while the other does not. Household wealth indices, which are commonly constructed from household asset inventories using principal component analysis, are not designed to measure intra-household resource distribution [3]. [4] shows that household expenditure patterns can differ depending on which household member controls assets. [5, 6] similarly argues that women's command over property, not only household prosperity, is central to their bargaining position and welfare. If individual resource control shapes women's ability to seek healthcare independently of household wealth, then analyses based only on household wealth may miss an important form of gendered economic inequality.

Women's individual ownership of land or housing offers a measurable indicator of resource control that is conceptually distinct from household wealth. The BDHS records whether women own land and/or a house and whether this ownership is held alone or jointly. This distinction is theoretically important. Sole ownership may indicate greater individual control over a productive or residential asset, although actual control may still depend on household relations, legal documentation, and local norms. Joint ownership, often with a husband or another family member, may provide an economic stake but not the same level of independent control [7]. Evidence from South Asia supports the relevance of women's property rights for empowerment and welfare. [8] find that women's land ownership is positively associated with empowerment in Nepal, using methods that address selection into ownership. [9] finds that women's land rights are associated with better child health outcomes. At the same time, [10] caution that property rights do not automatically produce empowerment, because their implications vary by social position, household relations, and local context. Despite this evidence, to our knowledge, no study has directly examined whether women's individual land or house ownership is associated with healthcare access barriers in Bangladesh, or whether sole and joint ownership show different associations. This gap is particularly relevant because female asset ownership remains rare: in the present BDHS 2022 analytical sample, fewer than one in ten currently married women report owning any land or housing.

Several theoretical frameworks support the expectation of such associations. Agarwal's bargaining framework suggests that property ownership may strengthen women's fallback position, or the outside option available if intra-household cooperation weakens, thereby improving their bargaining power over

household decisions, including decisions about mobility and healthcare seeking [5, 6]. This logic implies two possible channels. The first is an economic channel: ownership may reduce financial barriers by increasing economic security. The second is an autonomy channel: ownership may reduce permission and accompaniment barriers by strengthening women's bargaining position. Sole ownership may be more closely linked to both channels, while joint ownership may be more closely linked to the economic channel. [11] empowerment framework complements this logic by treating ownership as a material resource, agency as women's ability to make and act on decisions, and reduced healthcare barriers as an achievement. [12] behavioural model of health service use also situates ownership as an enabling factor for healthcare access. At the community level, socio-ecological theory suggests that individual resources may operate differently depending on local norms [13]. In communities where female ownership is more common, women's individual ownership may be more socially accepted and may therefore have stronger practical relevance. This expectation is consistent with recent BDHS 2022 evidence showing that community-level empowerment is related to women's health behaviour in Bangladesh [14].

Three gaps motivate this study. First, existing Bangladesh studies on women's healthcare access barriers examine education, household wealth, residence, and other conventional determinants, but they do not test whether women's own ownership of land or housing is associated with barriers independently of household wealth [1, 2]. Second, although [15] examine asset ownership and healthcare barriers among married women in Afghanistan, the Bangladesh context remains unexamined, and the distinction between sole and joint ownership has not been placed at the center of healthcare-barrier analysis. Third, no study has examined whether community-level female ownership prevalence moderates the association between individual ownership and healthcare access barriers. These gaps matter because household wealth, individual ownership, and community gender context may represent different dimensions of women's socioeconomic position.

Using nationally representative data from the 2022 BDHS, this study examines 18,954 currently married women nested in 674 clusters. It addresses three research questions. First, is women's sole or joint ownership of land or housing associated with healthcare access barriers after adjusting for household wealth and other confounders? Second, do sole and joint ownership show different associations with financial or access-cost barriers, measured by money and distance, and autonomy-related barriers, measured by permission and going alone? Third, does community-level female ownership moderate the individual-level ownership–barrier association? To answer these questions, the study uses progressive covariate adjustment to examine whether ownership associations persist after controlling for household wealth, barrier-specific models to assess patterns consistent with economic and autonomy-related channels, and multilevel logistic regression with cross-level interactions to examine community moderation. Figure 1 presents the conceptual framework guiding the empirical analysis.

2. Methods

2.1 Study design and data source

This study used data from the 2022 Bangladesh Demographic and Health Survey (BDHS), a nationally representative cross-sectional survey conducted by the National Institute of Population Research and Training (NIPORT) in partnership with ICF under the DHS Program. The BDHS used a two-stage stratified cluster sampling design. In the first stage, 675 enumeration areas were selected with probability proportional to size from the 2022 census frame, stratified by administrative division and urban-rural residence. In the second stage, 30 households were systematically selected from each enumeration area. The women's questionnaire was administered to currently married women aged 15 to 49 in selected households [16].

2.2 Study population and analytical sample

The full BDHS 2022 women's sample included 30,078 women. The healthcare-barrier and ownership modules were administered to currently married women. After excluding 10,091 women who were not currently married, 19,987 women had healthcare-barrier data. We then excluded 1,033 women with missing data on covariates used in the main models, mainly husband's education. The final analytical sample included 18,954 currently married women nested in 674 clusters.

We compared included and excluded observations on key characteristics. This comparison is reported in Supplementary Table S1 [see Additional file 1]. Because the analytical sample is restricted to currently married women with complete covariate data, the findings should be interpreted as applying to this population.

2.3 Outcome variables

The outcomes were self-reported healthcare access barriers. The BDHS asks currently married women: "When you are sick and want to get medical advice or treatment, is each of the following a big problem or not a big problem?" Four barriers were analysed: obtaining permission to go, getting money needed for treatment, distance to a health facility, and not wanting to go alone. Each item was coded as a binary variable equal to 1 if the respondent reported the item as a big problem and 0 otherwise.

Two composite outcomes were also constructed. "Any barrier" was coded as 1 if the respondent reported at least one of the four barriers. "Multiple barriers" was coded as 1 if the respondent reported two or more barriers. These outcomes measure perceived access barriers rather than observed healthcare use or objective facility access.

2.4 Exposure variable: women's land or house ownership

The primary exposure was women's reported ownership of land or housing. The BDHS asks whether the respondent owns land and/or a house and whether each asset is owned alone, jointly with a husband or partner, jointly with someone else, jointly with both, or both alone and jointly.

We constructed a three-category ownership variable. The reference category was no ownership, defined as not owning land or a house. The second category was joint-only ownership, defined as owning land or housing jointly but not alone. The third category was any sole ownership, defined as owning land or

housing alone, or both alone and jointly. In the analytical sample, 90.9% of women reported no ownership, 3.7% reported joint-only ownership, and 5.5% reported any sole ownership.

This classification focuses on the form of ownership rather than the number of assets owned. A woman classified as having any sole ownership may also hold joint assets, but she has at least one land or housing asset reported as owned alone. This distinction follows the theoretical expectation that sole ownership may indicate greater individual control than joint ownership, although actual control may still vary by household relations, documentation, and local norms.

2.5 Covariates

Covariates were selected based on previous studies of healthcare access barriers in South Asia and the conceptual framework of this study. The main models adjusted for variables that may be associated with both land or house ownership and healthcare access barriers.

Individual-level covariates included age, education, parity, employment status, media exposure, and age at marriage. Education was coded as no education, primary, secondary, and higher. Household-level covariates included DHS household wealth quintile, household size, residence, religion, and husband's education. Geographic context was adjusted using division fixed effects.

Household wealth quintile was included because the main objective of the study was to examine whether women's individual land or house ownership was associated with healthcare barriers beyond household-level economic status. Husband's education was included as a measure of spousal socioeconomic position. Residence and division were included to account for geographic differences in healthcare access and social context.

Two agency-related variables were added in the final model: decision-making participation and rejection of wife-beating. The decision-making score summed whether the respondent participated alone or jointly in decisions about her own healthcare, large household purchases, and visits to family or relatives. The score ranged from 0 to 3. The rejection of wife-beating score summed disagreement with five DHS scenarios justifying wife-beating and ranged from 0 to 5. Because these variables may lie on the pathway between ownership and healthcare barriers, they were added only in the final model. The comparison of models with and without these variables is interpreted descriptively and not as formal causal mediation analysis.

2.6 Community-level variables

Community-level variables were constructed at the BDHS cluster level using leave-one-out cluster means. This approach excludes the respondent's own value from the cluster mean and reduces mechanical correlation between individual and community-level measures.

Three community-level variables were constructed: community female land or house ownership prevalence, community decision-making score, and community rejection of wife-beating score. All community-level variables were standardized to have mean 0 and standard deviation 1. Therefore,

coefficients for these variables represent the association with a one-standard-deviation increase in the community measure.

2.7 Statistical analysis

2.7.1 Survey-weighted logistic regression

The main analysis used survey-weighted logistic regression to estimate the association between women's land or house ownership and healthcare access barriers. The models accounted for BDHS sampling weights, stratification, and clustering using design-based inference. Sampling weights were calculated as V005 divided by 1,000,000.

For each binary outcome, the general model was:

$$logit\left[P\left(Y_i = 1\right)\right] = \beta_0 + \beta_1 Joint_i + \beta_2 Sole_i + X_i' \gamma_k$$

where Y_i is the healthcare access barrier outcome for woman (*i*), $Joint_i$ indicates joint-only ownership, $Sole_i$ indicates any sole ownership and X_i is the vector of covariates included in each model, women with no land or house ownership were the reference group.

Six progressively adjusted models were estimated. Model 1 included ownership only. Model 2 added age, education, and parity. Model 3 added household wealth quintile, residence, and household size. This model was central because it examined whether ownership associations persisted after adjustment for household-level economic status. Model 4 added husband's education, religion, and division fixed effects. Model 5 added employment status, media exposure, and age at marriage. Model 5 was treated as the main total-association model. Model 6 added decision-making participation and rejection of wife-beating. The comparison between Model 5 and Model 6 was used to descriptively assess whether adjustment for measured agency-related variables attenuated the ownership associations.

2.7.2 Barrier-specific models

Separate survey-weighted logistic regression models were estimated for each of the four barrier outcomes: permission, money, distance, and going alone. These models used the Model 5 covariate specification. This analysis examined whether sole and joint ownership showed different associations across financial or access-cost barriers and autonomy-related barriers. The barrier-specific results were interpreted as patterns consistent with the proposed economic and autonomy-related channels, not as causal evidence of mechanisms.

2.7.3 Multilevel models and community moderation

To examine community-level associations, we estimated multilevel logistic regression models with random intercepts for BDHS clusters. These models included individual ownership categories, individual-level covariates, and standardized community-level variables.

The multilevel model was specified as:

$$logit\left[P\left(Y_{ij}=1\right)\right]=\beta_0+\beta_1 Joint_{ij}+\beta_2 Sole_{ij}+X'_{ij}\gamma+Z'_{ij}\partial+u_j$$

where Y_{ij} is the healthcare access barrier outcome for woman *i* in cluster *j*, $joint_{ij}$ and $Sole_{ij}$ indicate individual ownership categories, X_{ij} is the vector of individual and household covariates, Z_j is the vector of standardized community-level variables, and u_j is the random cluster intercept.

The intraclass correlation coefficient was calculated to assess the share of unexplained variation in healthcare barriers attributable to between-cluster differences:

$$\rho=\frac{\sigma_u^2}{\sigma_u^2+\frac{\pi^2}{3}}$$

where σ_u^2 is the between-cluster variance and $\pi^2/3$ is the level-1 logistic variance. Cross-level interaction terms between individual ownership and community-level female ownership prevalence were then added to examine whether community ownership moderated the individual-level ownership-barrier association. Predicted probabilities were calculated at low, mean, and high levels of community female ownership, defined as minus one standard deviation, the mean, and plus one standard deviation.

The survey-weighted and multilevel approaches answer related but different questions. Survey-weighted models prioritize design-based population inference. Multilevel models explicitly model between-cluster variation and allow cross-level interactions. We therefore used multilevel models as the main specification for community-level questions and reported survey-weighted interaction models as robustness checks.

2.7.4 Post-estimation and sensitivity analyses

Average marginal effects were calculated from Model 5 to express ownership associations as percentage-point differences in predicted probability. This was important because odds ratios can be difficult to interpret when outcomes are common.

Wald tests were used to assess whether the coefficients for joint and sole ownership differed statistically. This avoids interpreting differences in statistical significance as evidence that the two coefficients are different.

E-values were calculated for the main ownership associations to assess the minimum strength of unmeasured confounding that would be required to explain away the observed associations.

Several sensitivity analyses were conducted. First, ownership was recoded as a binary variable comparing any ownership with no ownership. Second, land and house ownership were entered separately. Third, community and interaction models were estimated using both multilevel and survey-weighted specifications. Results were considered more robust when direction, magnitude, and statistical significance were broadly consistent across specifications. Full model specifications, including all

covariate coefficients, are reported in Supplementary Tables S2–S5 [see Additional file 1]. Alternative ownership specifications are reported in Supplementary Table S6 [see Additional file 1].

2.8 Software and reproducibility

Analyses were conducted in R version 4.5.2. Survey-weighted models were estimated using the survey package. Multilevel models were estimated using lme4. Average marginal effects were estimated using marginal-effects. Analytical code is available from the corresponding author upon reasonable request.

3. Results

3.1 Sample characteristics

Table 1 describes the analytical sample by ownership category. Among 18,954 currently married women, 90.9% (n = 17,226) reported no land or house ownership, 3.7% (n = 693) reported joint-only ownership, and 5.5% (n = 1,035) reported any sole ownership. Asset-owning women were older and more socioeconomically advantaged than non-owners. For example, 36.6% of sole owners were in the richest wealth quintile, compared with 20.8% of non-owners. Sole owners were also more likely to be employed (38.1% vs. 29.5%) and had slightly higher decision-making scores (2.34 vs. 2.18). Rural residence and rejection of wife-beating did not differ significantly across ownership groups.

The prevalence of healthcare access barriers varied across ownership groups. Any barrier was reported by 66.6% of non-owners, 59.0% of joint-only owners, and 57.2% of sole owners. Multiple barriers were reported by 48.0% of non-owners compared with 37.6% of sole owners. Among the individual barriers, the money barrier was most common (47.6% overall), followed by distance (45.4%), going alone (39.3%), and permission (25.5%).

Table 1
Sample characteristics by land or house ownership category (n = 18,954)

Sociodemographic	**Total**	**None**	**Joint**	**Sole**	**p**
Mean age (years)	31.6	31.1	35.1	36.9	< 0.001
Education (%)					
None	12.8	12.7	15.4	13.6	< 0.001
Primary	25.8	25.9	26.3	23.4	
Secondary	46.6	46.9	40.0	41.5	
Higher	14.8	14.5	18.3	21.4	
Wealth quintile (%)					
Poorest	17.8	18.4	11.4	10.3	< 0.001
Poorer	19.6	20.0	18.8	13.3	
Middle	20.0	20.1	18.5	18.1	
Richer	20.7	20.7	21.4	21.6	
Richest	21.9	20.8	30.0	36.6	
Rural (%)	65.2	65.4	62.3	62.4	0.449
Muslim (%)	89.6	89.3	89.3	94.6	0.008
Mean parity	2.1	2.1	2.4	2.4	< 0.001
Working (%)	30.3	29.5	31.6	38.1	< 0.001
Empowerment					
DM score (0–3)	2.19	2.18	2.22	2.34	< 0.001
RWB score (0–5)	4.71	4.71	4.69	4.70	0.897
Barriers (%)					
Any (≥ 1)	65.8	66.6	59.0	57.2	< 0.001
Multiple (≥ 2)	47.3	48.0	44.1	37.6	< 0.001
Permission	25.5	25.9	26.5	18.6	0.004

Note: *Weighted percentages. p-values from design-adjusted Rao–Scott chi-squared tests (categorical) and survey-weighted Wald F-tests (continuous). DM = decision-making autonomy. RWB = rejection of wife-beating.*

Sociodemographic	Total	None	Joint	Sole	p
Money	47.6	47.5	39.3	34.6	< 0.001
Distance	45.4	46.4	41.8	40.0	0.005
Going alone	39.3	40.5	36.2	32.9	< 0.001

Note: *Weighted percentages. p-values from design-adjusted Rao–Scott chi-squared tests (categorical) and survey-weighted Wald F-tests (continuous). DM = decision-making autonomy. RWB = rejection of wife-beating.*

3.2 Progressive models: ownership beyond wealth

Table 2 presents the results of progressively adjusted logistic regression models. In the unadjusted model (M1), both joint-only ownership (OR = 0.719, 95% CI: 0.555–0.930) and sole ownership (OR = 0.669, 95% CI: 0.575–0.778) were associated with lower odds of reporting any barrier. After adding household wealth quintile in Model 3, the sole ownership coefficient attenuated modestly from OR = 0.715 to OR = 0.732 but remained highly significant ($p < 0.001$). This suggests that women's individual land or house ownership is not simply a proxy for household-level economic status.

In the fully adjusted Model 5 (total association model), sole ownership was associated with 22% lower odds of any barrier (OR = 0.777, 95% CI: 0.662–0.912) and 26% lower odds of multiple barriers (OR = 0.743, 95% CI: 0.629–0.877). In terms of average marginal effects, sole ownership was associated with a 5.6 percentage-point lower probability of any barrier ($p = 0.003$) and a 7.0 percentage-point lower probability of multiple barriers ($p < 0.001$). Joint-only ownership was associated with lower odds of any barrier (OR = 0.725, 95% CI: 0.560–0.939) but was not significantly associated with multiple barriers (OR = 0.849, $p = 0.175$).

Adding decision-making participation and rejection of wife-beating in Model 6 produced little attenuation: the sole ownership coefficient changed from OR = 0.777 to OR = 0.774. This suggests that these measured agency-related variables explain little of the ownership association. The Wald test comparing joint-only and sole ownership coefficients was not significant for either any barrier ($p = 0.628$) or multiple barriers ($p = 0.323$), indicating that the two ownership categories cannot be statistically distinguished in their overall association with barriers. Full covariate-adjusted results for the main total-association models are reported in Supplementary Table S2 [see Additional file 1].

Table 2
Progressive logistic regression models: land or house ownership and healthcare access barriers (survey-weighted odds ratios [95% CI])

	M1	M2	M3	M4	M5 (Total)	M6 (Direct)
Panel A: Any barrier						
Joint	0.719*	0.729*	0.745*	0.727*	0.725*	0.712**
	(0.56–0.93)	(0.56–0.95)	(0.58–0.97)	(0.56–0.94)	(0.56–0.94)	(0.55–0.92)
Sole	0.669***	0.715***	0.732***	0.775**	0.777**	0.774**
	(0.58–0.78)	(0.61–0.83)	(0.63–0.86)	(0.66–0.91)	(0.66–0.91)	(0.66–0.91)
AME Joint					−7.3pp*	
AME Sole					−5.6pp**	
Panel B: Multiple barriers						
Joint	0.856	0.862	0.887	0.850	0.849	0.834
	(0.67–1.09)	(0.68–1.10)	(0.70–1.12)	(0.67–1.08)	(0.67–1.08)	(0.66–1.05)
Sole	0.654***	0.688***	0.709***	0.737***	0.743***	0.738***
	(0.56–0.77)	(0.59–0.81)	(0.60–0.84)	(0.63–0.87)	(0.63–0.88)	(0.62–0.87)
AME Joint					−3.9pp	
AME Sole					−7.0pp***	
Wald p (J = S)					0.628 / 0.323	

Note: *Reference: no ownership. M1 = unadjusted. M2 = + age, education, parity. M3 = + wealth, residence, household size. M4 = + husband's education, religion, division. M5 = + employment, media, age at marriage. M6 = + decision-making, wife-beating rejection. AME = average marginal effect (pp). Wald p: H_0: β(joint) = β(sole) for any/multiple. * p < 0.05, ** p < 0.01, *** p < 0.001. n = 18,954.*

3.3 Barrier-specific models: economic versus autonomy pathways

Table 3 presents the results of separate logistic regression models for each barrier using the Model 5 covariate specification. Sole ownership was associated with significantly lower odds of all four barriers:

permission (OR = 0.737, 95% CI: 0.601–0.905), money (OR = 0.651, 95% CI: 0.544–0.778), distance (OR = 0.848, 95% CI: 0.719–0.999), and going alone (OR = 0.846, 95% CI: 0.721–0.991). Joint-only ownership was significantly associated only with the money barrier (OR = 0.697, 95% CI: 0.541–0.897) and was not associated with permission (OR = 1.018, p = 0.903), distance (OR = 0.819, p = 0.080), or going alone (OR = 0.873, p = 0.255).

The pattern is consistent with the proposed distinction between financial or access-cost barriers and autonomy-related barriers. However, Wald tests comparing joint-only and sole ownership coefficients were not statistically significant for most barriers (permission: p = 0.054; money: p = 0.633; distance: p = 0.795; going alone: p = 0.814), so the evidence for differential associations should be interpreted cautiously. Full covariate-adjusted barrier-specific models are reported in Supplementary Table S3 [see Additional file 1].

Table 3
Barrier-specific logistic regression models (Model 5, survey-weighted)

Prevalence (%)	**Permission**	**Money**	**Distance**	**Going alone**
	25.5	**47.6**	**45.4**	**39.3**
Joint	1.018	0.697**	0.819	0.873
	(0.76–1.36)	(0.54–0.90)	(0.65–1.02)	(0.69–1.10)
Sole	0.737**	0.651***	0.848*	0.846*
	(0.60–0.91)	(0.54–0.78)	(0.72–1.00)	(0.72–0.99)
Wald p (J = S)	0.054	0.633	0.795	0.814

Note: *OR [95% CI]. Reference: no ownership. Full M5 covariates. * p < 0.05, ** p < 0.01, *** p < 0.001. n = 18,954.*

3.4 Community-context multilevel models

The intraclass correlation coefficients were 14.0% for any barrier and 10.6% for multiple barriers, indicating meaningful between-cluster variation in healthcare access barriers and supporting the use of multilevel models. Full multilevel model results, including all covariates, are reported in Supplementary Table S4 [see Additional file 1].

Table 4
Community-context multilevel logistic regression with random cluster intercepts

Individual-level (multilevel)	**Any barrier**	**Multiple barriers**
Joint ownership	0.607*** (0.51–0.72)	0.693*** (0.59–0.82)
Sole ownership	0.774*** (0.67–0.89)	0.786** (0.68–0.91)
Community-level		
Community female ownership (z)	1.002 (0.94–1.07)	0.996 (0.94–1.06)
Community decision-making (z)	1.103** (1.02–1.19)	1.138*** (1.07–1.22)
Community wife-beating rej. (z)	0.907** (0.85–0.97)	0.886*** (0.83–0.94)
Survey-weighted robustness		
Joint (survey-weighted)	0.709** (0.55–0.91)	0.828 (0.66–1.04)
Sole (survey-weighted)	0.773** (0.66–0.91)	0.739*** (0.63–0.87)
Model statistics		
ICC (%)	14.0	10.6
Clusters / n	674 / 18,954	674 / 18,954

Note: *OR (95% CI). Reference: no ownership. All models include M5 covariates. Community variables are leave-one-out cluster means, z-standardised. The discrepancy between multilevel and survey-weighted joint ownership estimates (0.607 vs. 0.709) reflects differences in how between-cluster variation is modelled; both approaches yield consistent conclusions regarding significance and direction. * p < 0.05, ** p < 0.01, *** p < 0.001.*

Table 4 presents the multilevel logistic regression results with random cluster intercepts. In multilevel models, both joint-only ownership (OR = 0.607, 95% CI: 0.511–0.721) and sole ownership (OR = 0.774, 95% CI: 0.672–0.892) were associated with lower odds of any barrier. For multiple barriers, both ownership categories were also significantly associated (joint-only: OR = 0.693; sole: OR = 0.786). Community-level female land or house ownership prevalence was not independently associated with barriers (any barrier: OR = 1.002, p = 0.957; multiple barriers: OR = 0.996, p = 0.881). Community decision-making was positively associated with barriers, while community rejection of wife-beating was negatively associated with barriers.

In survey-weighted robustness checks, the sole ownership estimates were similar and statistically significant for both outcomes (any barrier: OR = 0.773, p = 0.002; multiple barriers: OR = 0.739, p < 0.001), while the joint-only estimate was statistically significant for any barrier (OR = 0.709, p = 0.008) but not for multiple barriers (OR = 0.828, p = 0.109).

3.5 Cross-level interaction: community moderation

Table 5 presents the cross-level interaction between individual ownership and community-level female ownership prevalence. For any barrier, the interaction between sole ownership and community ownership was significant in the multilevel model (OR = 0.850, 95% CI: 0.744–0.970, p = 0.016), suggesting that the sole ownership association was stronger in communities with higher female ownership prevalence. For multiple barriers, the interaction was borderline (OR = 0.875, p = 0.055). The interaction for joint-only ownership was not significant for either outcome.

However, in survey-weighted robustness checks, the sole ownership interaction was not significant for any barrier (OR = 0.885, p = 0.114) or multiple barriers (OR = 0.858, p = 0.053). These results provide suggestive, but specification-sensitive, evidence of community moderation. Full cross-level interaction models are reported in Supplementary Table S5 [see Additional file 1].

Table 5
Cross-level interaction between individual land or house ownership and community female ownership prevalence

Main effects	**Any (ML)**	**Any (SVY)**	**Multi (ML)**	**Multi (SVY)**
Joint	0.652***	0.718**	0.681***	0.788
	(0.54–0.79)	(0.56–0.92)	(0.56–0.83)	(0.61–1.01)
Sole	0.815**	0.798**	0.817**	0.767**
	(0.70–0.95)	(0.68–0.94)	(0.71–0.95)	(0.65–0.91)
Comm. own. (z)	1.021	1.027	1.003	1.020
Interactions				
Joint × comm.	0.881	0.972	1.022	1.071
	(0.76–1.02)	(0.75–1.26)	(0.88–1.18)	(0.85–1.35)
Sole × comm.	0.850*	0.885	0.875	0.858
	(0.74–0.97)	(0.76–1.03)	(0.76–1.00)	(0.74–1.00)
Pred. prob. (ML)				
None: L / M / H	63.3 / 63.8 / 64.3			
Joint: L / M / H	56.1 / 53.5 / 50.9			
Sole: L / M / H	62.3 / 59.0 / 55.5			

Note: *OR (95% CI). ML = multilevel (random cluster intercept). SVY = survey-weighted. All models include M5 covariates + community decision-making and wife-beating rejection (z). Predicted probabilities at community ownership = − 1 SD (L), 0 (M), + 1 SD (H). * p < 0.05, ** p < 0.01, *** p < 0.001.*

Figure 2 presents model-predicted probabilities from the multilevel interaction model for any barrier. Predicted probabilities for non-owners were nearly unchanged across community ownership levels (63.3% at − 1 SD to 64.3% at + 1 SD). Model-predicted probabilities for sole owners were lower at higher levels of community female ownership (62.3% at − 1 SD to 55.5% at + 1 SD), while predicted probabilities for joint-only owners ranged from 56.1% to 50.9%.

3.6 Sensitivity analyses

E-value analysis indicated modest robustness to unmeasured confounding. For sole ownership and any barrier (OR = 0.777), the E-value for the point estimate was 1.89; for the confidence interval bound closest to the null (upper bound = 0.912), the E-value was 1.42. For joint-only ownership and any barrier (OR = 0.725, upper CI = 0.939), the corresponding E-values were 2.10 (point) and 1.33 (CI bound). For sole ownership and multiple barriers (OR = 0.743, upper CI = 0.877), E-values were 2.03 (point) and 1.54 (CI bound). The relatively small CI-bound E-values (1.33–1.54) indicate that a modestly strong unmeasured confounder could shift the confidence intervals to include the null.

Results were robust to alternative ownership specifications. Binary ownership (any ownership vs. none) was associated with lower odds of any barrier (OR = 0.755, $p < 0.001$) and multiple barriers (OR = 0.787, $p = 0.002$). In separate models for land and house ownership, sole land ownership (OR = 0.789, $p = 0.049$), joint house ownership (OR = 0.603, $p = 0.005$), and sole house ownership for multiple barriers (OR = 0.805, $p = 0.036$) were significantly associated with lower barrier odds. Full alternative ownership specification results are reported in Supplementary Table S6 [see Additional file 1].

4. Discussion

This study examined whether women's individual ownership of land or housing is associated with self-reported healthcare access barriers among currently married women in Bangladesh. Three findings are central. First, both joint-only and sole ownership were associated with lower odds of reporting healthcare barriers, and the association for sole ownership persisted after adjustment for household wealth and other confounders. Second, the barrier-specific results suggested different patterns by ownership type: sole ownership was associated with lower odds of permission, money, distance, and going-alone barriers, while joint-only ownership was associated mainly with the money barrier. Third, community-level female ownership moderated the association between sole ownership and any barrier in multilevel models, although this result was not statistically significant in the survey-weighted robustness check. Overall, the findings suggest that women's own land or house ownership captures a dimension of resource control that is not fully reflected by household wealth.

The persistence of the ownership association after wealth adjustment is the most important contribution of this study. DHS-based analyses commonly use household wealth as the main measure of socioeconomic position. Previous Bangladesh studies show that wealth, education, residence, and husband's education are important predictors of healthcare access barriers [1, 2]. This study adds that

household wealth and women's own ownership are not the same concept. Household wealth measures the household's overall asset position, but it does not show who controls resources inside the household. The finding that ownership associations persisted after wealth adjustment supports the argument that individual resource control may matter for women's healthcare access beyond household-level economic status. This is consistent with [4] argument that household-level measures can mask gendered control over resources, and with [5, 6] emphasis on women's command over property as a source of bargaining power.

The barrier-specific findings provide cautious support for the proposed distinction between economic/access-cost and autonomy-related channels. Sole ownership was associated with lower odds of all four barriers, including permission and going alone. These two barriers are especially relevant to women's autonomy because they reflect dependence on others for approval, accompaniment, or mobility. Joint-only ownership, by contrast, was associated mainly with the money barrier. This pattern is consistent with Agarwal's bargaining framework: ownership held alone may signal a stronger fallback position than ownership held jointly, while joint ownership may provide some economic stake without the same level of individual control. However, this interpretation should remain cautious. Wald tests comparing sole and joint-only coefficients were not statistically significant for most barriers. Therefore, the results suggest possible differences by ownership type, but they do not conclusively establish that sole and joint ownership operate through different channels.

The limited attenuation after adding decision-making participation and rejection of wife-beating also deserves careful interpretation. These variables were included to assess whether measured agency-related factors explained part of the ownership association. The estimates changed little after their inclusion. This may reflect the limited capacity of standard DHS decision-making and attitude indicators to capture women's practical control over assets, mobility, negotiation power, or ability to seek care. Therefore, the lack of attenuation should not be interpreted as evidence that agency is unimportant. Rather, it suggests that the available agency-related measures explain little of the observed ownership association.

The community-level findings were mixed but informative. The intraclass correlation coefficients indicated meaningful clustering of healthcare barriers across communities, suggesting that local context matters. Community-level rejection of wife-beating was negatively associated with barriers, while community-level decision-making was positively associated with barriers. The positive association for community decision-making may reflect unmeasured community-level factors or differences in how women perceive and report barriers across contexts. The interaction between sole ownership and community-level female ownership was significant in the multilevel model for any barrier but not in the survey-weighted robustness check. This provides suggestive, but not definitive, evidence that women's individual ownership may be more relevant in communities where female ownership is more common. This interpretation is consistent with socio-ecological theory and with recent BDHS 2022 evidence showing that community empowerment is associated with women's health behaviour in Bangladesh

[14]. However, because the moderation result is sensitive to model specification, it should be treated as exploratory.

This study extends several strands of literature. It complements Bangladesh healthcare-barrier studies by adding women's own land and house ownership as a distinct dimension of socioeconomic position beyond household wealth. It also extends [15], who examined asset ownership and healthcare barriers among married women in Afghanistan, by focusing on Bangladesh and by distinguishing sole from joint ownership. The findings are also consistent with South Asian evidence linking women's land rights with empowerment and welfare outcomes [8, 9]. At the same time, the results support the caution raised by [10]: property ownership should not be treated as automatically empowering. Its meaning depends on the form of ownership, the household setting, and the wider social context.

5. Limitations

This study has several limitations. First, the cross-sectional design prevents causal interpretation. The analysis shows associations between women's land or house ownership and healthcare access barriers, but it cannot establish whether ownership reduced barriers or whether women with fewer barriers were more likely to acquire or report ownership. Second, unmeasured confounding remains possible. The E-values indicate modest robustness, but a sufficiently strong unmeasured factor, such as family background, inheritance position, marital quality, or local health-service availability, could partly explain the observed associations.

Third, both exposure and outcomes are self-reported. The BDHS records whether women report owning land or housing, but it does not verify legal title, documentation, actual control, or the ability to sell, use, or transfer the asset. Similarly, healthcare barriers are perceived barriers rather than observed healthcare use or objective measures of facility access. Women who own assets may also perceive or report barriers differently from women who do not own assets.

Fourth, the analysis is restricted to currently married women because the healthcare-barrier and ownership modules were administered to this group. The findings may not generalise to never-married, divorced, separated, or widowed women, whose healthcare access constraints and ownership patterns may differ. This restriction may also introduce selection if marital status is related to both ownership and healthcare access.

Fifth, female land or house ownership was rare in the sample. Only 3.7% of women reported joint-only ownership and 5.5% reported any sole ownership. This limits statistical power, especially for comparing sole and joint ownership and for estimating cross-level interactions. The Wald tests did not provide strong evidence that the joint-only and sole ownership coefficients differed for most outcomes.

Sixth, the study did not include supply-side measures such as facility distance, service quality, transport availability, or local healthcare infrastructure. The distance barrier is self-reported and may reflect both

geographic access and perceived difficulty. Future studies linking DHS data with facility or geospatial data could better separate household-level, individual-level, and supply-side constraints.

Seventh, the agency-related variables are limited. Decision-making participation and rejection of wife-beating are useful indicators, but they do not fully measure bargaining power, mobility, control over income, actual control over property, or negotiation within the household. The comparison between models with and without these variables is therefore descriptive and should not be interpreted as formal mediation analysis.

6. Conclusion

Women's individual ownership of land or housing is associated with fewer self-reported healthcare access barriers among currently married women in Bangladesh, even after adjustment for household wealth and other confounders. This finding suggests that household wealth and women's own resource control capture different dimensions of socioeconomic position. The barrier-specific results indicate that sole ownership is associated with lower odds of both financial or access-cost barriers and autonomy-related barriers, while joint-only ownership is associated mainly with the money barrier. However, differences between sole and joint ownership should be interpreted cautiously because Wald tests provide limited evidence that the coefficients differ statistically.

The findings support the importance of looking beyond household wealth in studies of women's healthcare access. They also suggest that the form of ownership may matter: land or housing owned alone may have different implications from land or housing owned jointly. Community context may further shape these associations, although the moderation results were sensitive to specification. Policies that strengthen women's secure and meaningful rights over land and housing may complement healthcare-access interventions, but causal evidence is needed before drawing strong policy conclusions. Future research should use longitudinal data, natural experiments, or linked facility and geospatial data to examine whether women's land and house ownership causally improves healthcare access and under what social conditions these associations are strongest.

Abbreviations

AME
Average marginal effect
BDHS
Bangladesh Demographic and Health Survey
BMRC
Bangladesh Medical Research Council
CI
Confidence interval
DHS

Demographic and Health Survey
DM
Decision-making autonomy
ICF
Inner City Fund
ICC
Intraclass correlation coefficient
IRB
Institutional Review Board
ML
Multilevel model
NIPORT
National Institute of Population Research and Training
OR
Odds ratio
pp
Percentage points
RWB
Rejection of wife-beating
SD
Standard deviation
SVY
Survey-weighted model

Declarations

Ethics approval and consent to participate

This study used publicly available, de-identified secondary data from the 2022 Bangladesh Demographic and Health Survey. The original survey protocol received ethical approval from the ICF Institutional Review Board and the Bangladesh Medical Research Council. All survey participants provided informed consent prior to data collection. No additional ethical approval was required for this secondary analysis of anonymised data.

Consent for publication

Not applicable.

Availability of data and materials

The BDHS 2022 datasets are publicly available from the DHS Program upon registration at https://dhsprogram.com. The supplementary regression outputs and supporting analyses are provided

as Additional file 1. The analytical code is available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MK and SDP conceptualized the study and developed the overall research design. MK, MBH, MZ, KMTH, MAM, and MAAA contributed to data preparation, variable construction, literature review, and interpretation of findings. MBH and MZ contributed to the statistical analysis and verification of analytical outputs. KMTH, MAAA and SMH contributed to the interpretation of the public health and social determinants aspects of the study. MK prepared the first draft of the manuscript. MK and SDP supervised the work, provided critical intellectual input, and revised the manuscript for important academic content. All authors reviewed, edited, and approved the final manuscript.

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Not applicable.

Ethical Statement

This study used publicly available, de-identified secondary data from the 2022 Bangladesh Demographic and Health Survey. The original survey protocol received ethical approval from the ICF Institutional Review Board (ICF IRB) and the Bangladesh Medical Research Council (BMRC). All survey participants provided informed consent prior to data collection. No additional ethical approval was required for this secondary analysis of anonymised data.

Use of AI Tools

AI was used only to improve language quality and clarity of the manuscript. It was not used to generate data, perform analyses, interpret results, or draw conclusions. The authors reviewed and approved the final manuscript and take full responsibility for its content.

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Figures

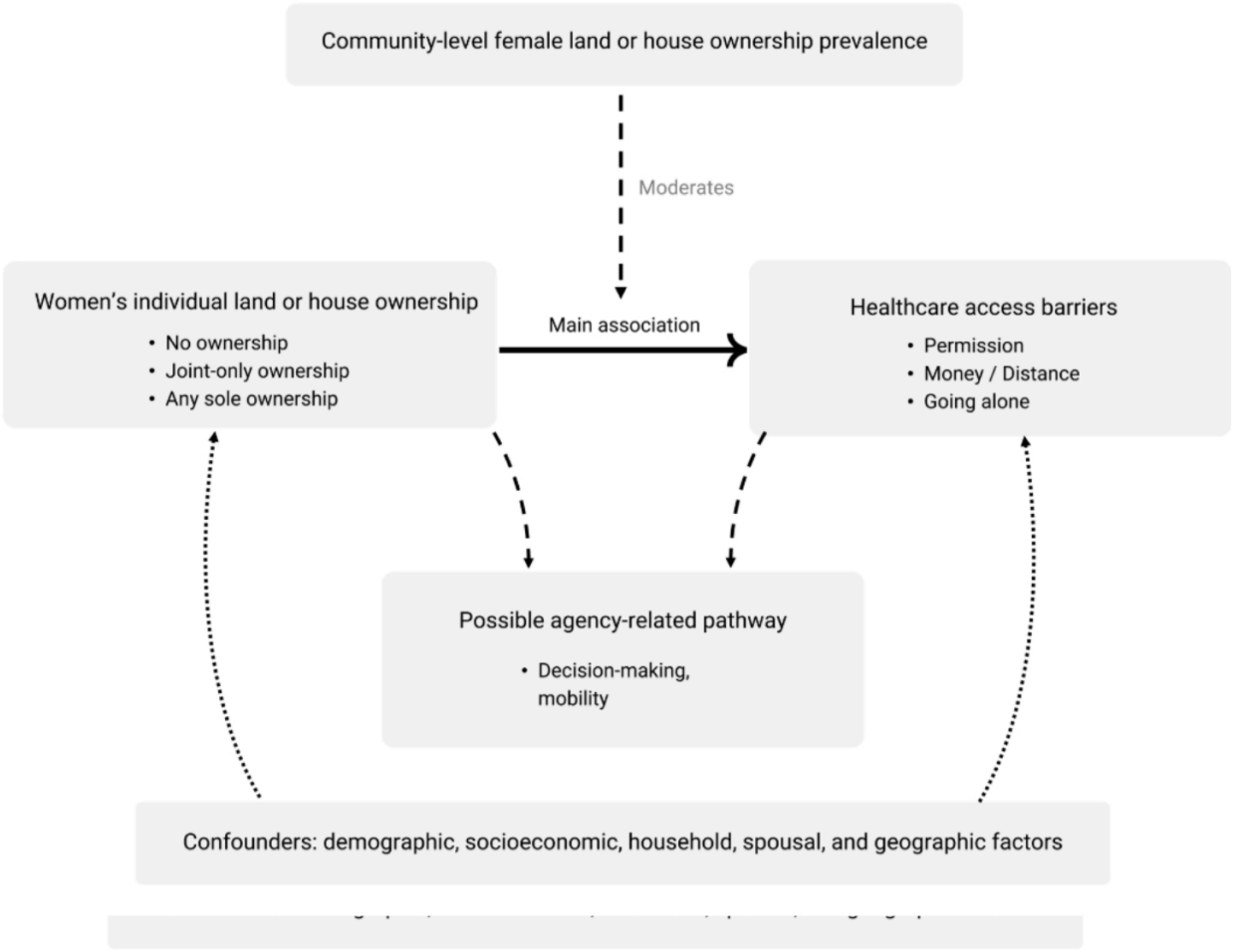


Figure 1

Conceptual framework linking women's land or house ownership to healthcare access barriers. Solid arrow represents the main association. Dashed arrows represent a possible agency-related pathway and community-level moderation. Dotted arrows represent confounding pathways. The framework is informed by bargaining theory [5, 6], empowerment theory [11], the behavioural model of healthcare access [12], and socio-ecological theory [13], but it guides association-based analysis and does not imply causal identification.

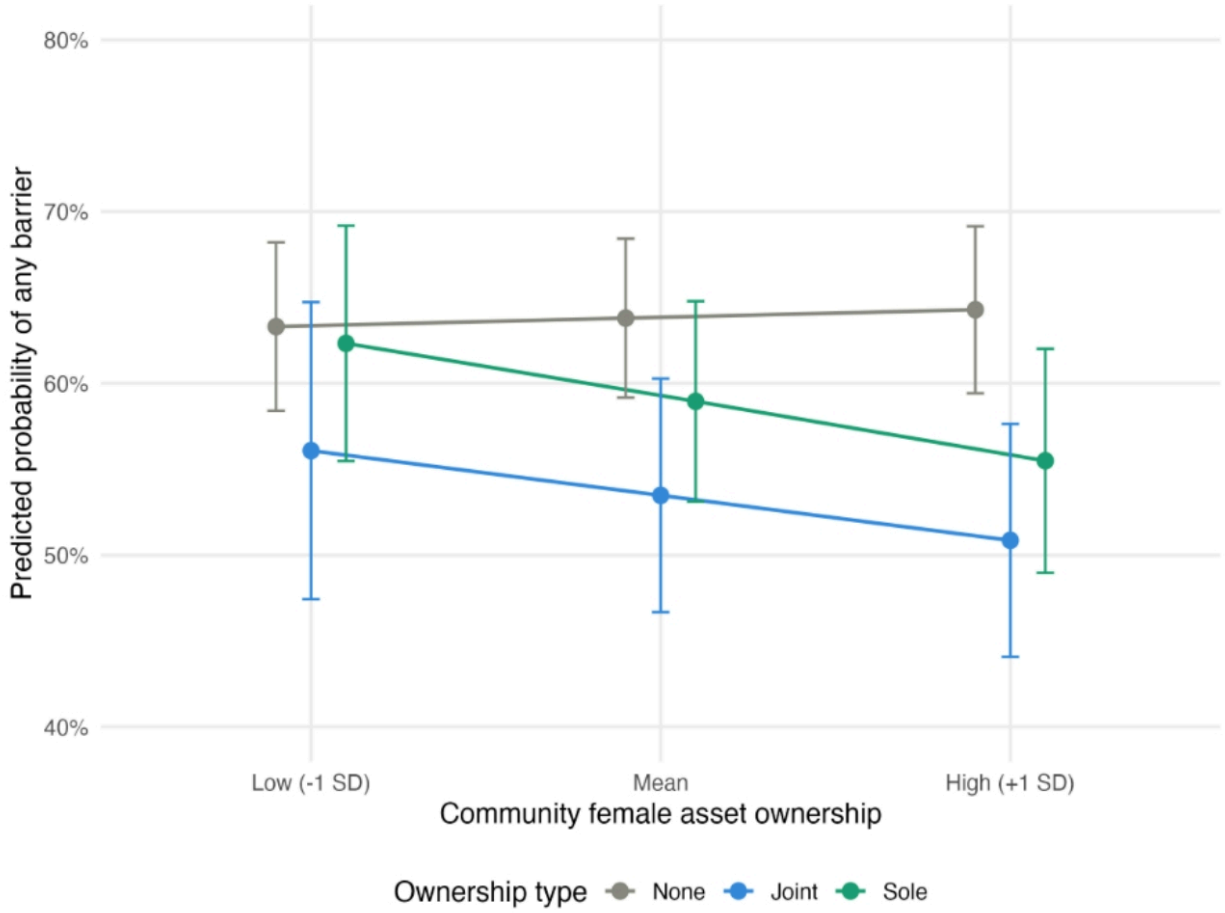


Figure 2

Model-predicted probability of any healthcare barrier by individual land or house ownership type and community-level female ownership prevalence. Estimates from multilevel logistic interaction model with 95% confidence intervals. Community ownership levels: Low (−1 SD), Mean (0), High (+1 SD).

Supplementary Files

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